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PATHOLOGY AND TREATMENT OF
THE EYE.



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FIG. 1.

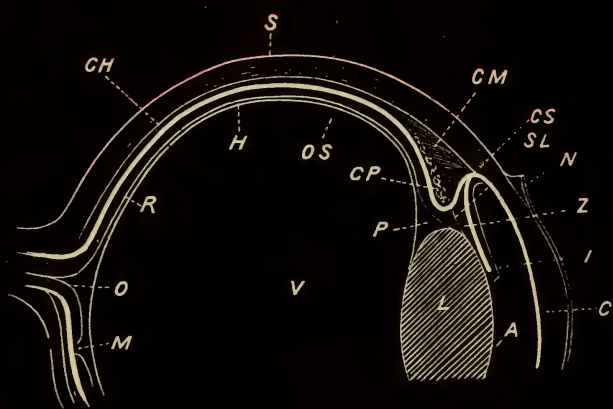


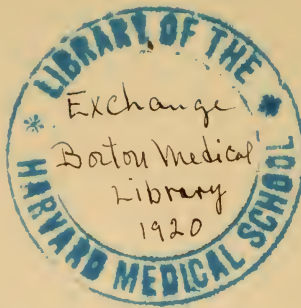
FIG. 2.

HANDBOOK
OF THE
DISEASES OF THE EYE:
THEIR
PATHOLOGY AND TREATMENT.

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BOSTON:
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CAMBRIDGE:

PRESS OF JOHN WILSON AND SON.

TO
DAVID J. VAN PRAAG,

This Book is Dedicated,

IN TOKEN OF FRIENDSHIP AND ESTEEM,

BY HIS BROTHER-IN-LAW,

THE AUTHOR.

PREFACE.

The rapid advancement of medicine during the present century has rendered it impossible to acquire a proper knowledge of its different departments, during the brief time usually allotted by students to its study.

We have deemed it expedient, therefore, to present this branch in a condensed form; at the same time trying to preserve whatever has been actually acquired to the science of ophthalmology.

The book is divided into two parts: the first includes the pathology and treatment of eye-diseases; and the second, the operative surgery of the eye. The practical portions of the work are given with as much detail as possible, and from the experience of the author; and it is hoped they will prove a useful guide, not alone to those entering this interesting department of medicine, but also to the busy practitioner, who finds himself unable to peruse the more elaborate treatises on this subject.

My thanks are heartily due to my friend Dr. H. F. Damon, who, although devoted to the study of derma-

tology, has very willingly relinquished a portion of his time, to assist in the correction of my proofs, as they were passing through the press.

If this little work shall fulfil the purpose for which it is intended, the author will be amply repaid for the labor and thought he has bestowed upon it.

Boston, November 1, 1869.

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FIG. I.

Ophthalmoscopic Appearance of Fundus of an Healthy Eye.



FIG. II.

Section of the Human Eye. — C. Cornea; N. Epithelial layer of cornea; S. Sclerotic; I. Iris; CP. Ciliary processes; CM. Ciliary muscle; CS. Circular Sinus; P. Canal of Petit; OS. Ora Serrata; Ch. Choroid; R. Retina; O. Optic disk; M. Macula lutea; SL. Suspensory ligament; L. Lens; H. Hyaloid; V. Vitreous; A. Anterior chamber; Z. Posterior chamber.

DISEASES OF THE EYE.

EXAMINATION OF THE EYE.

Inspection of the eye may be made either with or without artificial illumination.

Under ordinary circumstances, the light of day is sufficient for the examination of the external portions of the eye. When, however, its deeper membranes are to be explored, it becomes indispensable to make use of artificial light.

The ophthalmoscope is the instrument employed for this purpose.

Ophthalmoscope. — The ophthalmoscope now generally used, is a convex metallic mirror, about one and a half inches in diameter, and six inches in focal length. It is circular, with an aperture of about a line in diameter pierced through its centre. The mirror is mounted on a short or a long handle. To the side of the mirror is attached, by a hinge joint, a frame somewhat more than a semicircle in circumference, and grooved on its internal border, so as to permit, at will, a concave or convex lens to be inserted laterally into it.

When this instrument is used, the patient and observer must be seated in a dark room opposite one another, a light placed at the side and a little behind the patient's head, the flame being on the same level with his eyes. By means of the ophthalmoscope, the observer reflects the light on the patient's eye. When its interior is illuminated, the pupil appears red instead of black. The pupil may be previously dilated with a solution of atropine, if found necessary.

By only using the mirror, which is the direct method of observation, erect images of the anterior and posterior chambers of the eyes will be seen.

When both the mirror and the object-glass are employed, which is the indirect method of observation, inverted images of these parts are seen. In this method, the mirror is held as before, and the object-glass in the other hand, near the eye of the patient.

The use of convex eye-pieces in the hinged frame of the mirror, in cases where the observer is emmetropic or hypermetropic, will make the images more distinct.

Lateral Illumination of the Eye.—This may be done, either with lamp or gaslight, in a dark room, or by ordinary daylight near a window.

In either case, both the patient and observer are to be seated opposite each other.

When the lamp is used, it is placed on a table, at a short distance beside and in front, and a little above the level of the patient's eyes. The observer holds in one hand a biconvex lens of two, or two and a half inches,

focal length, with which the light is concentrated upon the eye; while in the other hand is held another lens in front of the eye, in order to magnify any portion of the cornea, iris, or lens.

When daylight is employed, the same positions must be taken near a window, and the lenses used in a similar manner.

By these means we are able to discover opacities of the cornea, foreign bodies in the cornea, or anterior chamber, false membranes on the capsule of the lens, and the different kinds of cataracts.

Among the instruments which are in use to examine the eye, must be mentioned the *ophthalmotonometer*, to test the tension of the eye-ball, as, for instance, in glaucoma; the *strabismometer*, used to measure the degree of diplopia, or squint, in different cases; the *pupillometer*, to measure the size of the pupil; and the *optometer* to determine exactly the near and far point of distinct vision.

THE VISUAL FIELD.

The visual field comprehends the entire space embraced by the eye when fixed on a determined point. When, for instance, the eye is fixed on a minute object, its axis is directed towards it; and, in this way, the image of the object is imprinted upon the most sensitive portion of the retina, which causes it to be seen with the utmost distinctness.

The mode of determining the visual field is as follows : The patient fixes the eye to be examined, on a given point, such as a white cross on a black board ; the other eye being closed, the operator moves his hand, or some other object, in various directions, gradually outwards from this central cross, until it vanishes from the view of the patient, and the spot is marked on the board. These vanishing points, when connected together, form the limits of the field of vision.

In like manner, we can examine from the periphery towards the centre.

ACUTENESS OF VISION.

Fixed scales have been adopted for the purpose of testing the acuteness of vision. The test-types of Jaeger, and those of Snellen, are those generally employed. A person who can read No. 1 of Snellen's test-types at one foot from the eye, and No. 20 at 20 feet, may be said to have normal acuteness of vision.

ANATOMY OF THE EYE.

THE *globe*, or eyeball, is held in its position in the cavity of the orbit by tenons-capsule, optic nerve, muscles, conjunctiva, and eyelids. These means of union serve to impress the most varied movements upon the eye. The anterior portion of the eye is a segment of a lesser sphere than the rest of the globe.

The membranes which compose the globe are as follows : Sclerotic, cornea, choroid, with ciliary processes, iris, and retina.

The media of the eye are the aqueous humor ; the crystalline lens and capsule ; and the vitreous humor, with its membrane.

Sclerotic. — The sclerotic, which is continuous with the cornea, and forms the greater segment of the eye, is generally of a white, also of a light bluish color, and is composed of elastic fibrous tissue, and contains but few vessels. These are derived from the anterior ciliary vessels, and the vasa vorticiosa of the choroid.

Cornea. — The cornea is the anterior and transparent part of the eye. It is a continuation of the sclerotic, and is covered by a thin layer of epithelium.

The cornea itself consists of different layers, and is without blood-vessels, except during foetal life.

Recently, nerves have been discovered in the superficial layer (Hoyer and Cohnheim).

Choroid.—The choroid is situated immediately beneath the sclerotic, and is a cellulo-vascular membrane.

The internal surface of the choroid is covered with a black pigment; and the same pigment exists in less quantity, on the external surface of this membrane.

The choroid extends to the anterior segment of the eye, and forms the ciliary processes.

The arteries of this membrane are derived from the short posterior ciliary vessels. Its veins are from the venæ vorticosæ.

Iris.—The iris is a screen, or diaphragm, with an opening in its centre, the pupil, capable of contracting or dilating. It divides the eye into its anterior and posterior chambers. It consists of radiated and circular muscular fibres, and is very vascular.

It is also plentifully supplied with nerves. Its veins and arteries are derived from the ciliary vessels. The nerves are derived from the fifth pair, the third pair, and from the sympathetic.

Retina.—The retina is that membrane of the eye which is destined to receive impressions from external objects, and transmit them to the brain. Its external surface lies in contact with the internal, or pigmentary surface of the choroid. Its internal surface is in contact with the vitreous membrane. It extends from the optic disc forwards to the ora serrata.

In the axis of vision, it presents a deeply tinted yellow spot, the macula lutea, the centre of which is excavated, and forms the fovea centralis.

The retina is partly of a nervous structure, and partly of modified connective tissue.

The nervous elements are divided into mosaic, and proper nervous layers. The connective tissue enters into all the layers.

The blood-vessels of the retina are branches of the central artery and vein.

Optic Nerve. — The optic nerve, after leaving the cerebrum, passes through the foramen opticum of the orbit, together with the retinal vessels. It penetrates the sclerotic through numerous openings made by the transverse elastic fibres of the sclerotic, the so-called lamina cribrosa. The optic nerve is enclosed in a fibrous sheath, and forms in the inner scleral surface the optic papilla.

Zonula of Zinn. — This suspensory ligament of the lens is of a fibro-cellular structure, is incorporated with the anterior surface of the lens-capsule, and must also be considered as the point of attachment of the retina.

Aqueous Humor. — The aqueous humor is a limpid, transparent liquid, which fills the space between the cornea and iris. A great many opinions exist in regard to its origin. By some, it is supposed to be exhaled from the surface of the iris; by others, from the posterior surface of the cornea.

Vitreous Humor. — The vitreous humor is a gelatinous, transparent mass, without vessels or nerves. It is situated between the lens and the retina, and is enclosed in the hyaloid membrane, which is very translucent.

Lens. — The lens is biconvex, enclosed in a capsule, and is situated in a depression in the anterior part of the

vitreous. It is transparent, and of a complex fibrous structure. Its anterior surface is less convex than its posterior. The circumference of the lens is enclosed by the ciliary processes of the vitreous body, and is immediately connected with the ciliary muscle.

Conjunctiva. — The conjunctiva is the lining membrane of the lids. It is also reflected upon the surface of the globe. The palpebral conjunctiva is very vascular, well supplied with nerves, and its free surface with papillæ. In the connective tissue of this membrane are a number of solitary and conglomerate glands. The ocular conjunctiva is quite vascular and loose in its texture, and is not supplied with papillæ.

Eyelids. — The eyelids consist of prolongations of the cutis, which serve as a protection for the eye. The points of union of the upper and lower lids are termed the external and the internal canthus. Near the inner angle of the lids are situated the lachrymal points, which lead to the lachrymal ducts. The eyelids are provided with muscles, cartilage, glands, arteries, nerves, and cilia on their free borders.

PATHOLOGY AND TREATMENT.

DISEASES OF THE ORBIT.

DISEASES of the orbit are caused by injuries, and by morbid growths.

The injuries of the orbit, such as fracture, fissure, &c., are inflicted by different kinds of implements, and are of great importance.

At first they may not appear to be of a serious character ; but, in some instances, they are followed later by the worst results. These are the fractures and fissures, which occur either directly, or by contra-coup, and which are often very difficult to discover, on account of the immediate and intense swelling of the tissues.

Intra-orbital effusion of blood, aneurysma, periostitis, ostitis, exostosis, caries, necrosis, &c., are also repeatedly noticed as the result of injuries, and may terminate in inflammation and suppuration of the cellular tissue of the orbit. They not unfrequently cause protrusion of the eyeball, with impaired vision ; and this is often to such an extent, that the sight is completely destroyed.

TREATMENT. — The details of the pathology and therapeutics of injuries of the orbit belong more to the province of special surgery.

Tumors. — The morbid growths of the orbit, such as the different encysted tumors, fibroid, scirrhus, &c., lead to exophthalmos, and consequently give rise to impairment, if not total destruction of vision. Their course is, in general, the same as in other parts of the body, involving the bones and other structures in their progress.

TREATMENT. — In morbid growths, entire extirpation of the disease is desirable.

DISEASES OF THE LACHRYMAL GLAND.

Dacryo-adenitis. — Inflammation of the lachrymal gland appears after injuries, or is a complication of inflammation of the connective tissue of the eye.

This affection is but rarely observed. The acute stage is marked by pain, glandular swelling, which is apt to push the eye down and inward, and impede its free motion; swelling of the upper lid, and a hypersecretion of tears. Sometimes the inflammation subsides; but it almost always terminates in suppuration. Often it becomes chronic, and leads to caries of the orbit and subsequent fistula in the region of the upper lid.

TREATMENT. — In acute inflammation, we must endeavor to prevent suppuration by an antiphlogistic treatment.

If suppuration sets in, apply poultices, and subsequently open the abscess. In cases of fistula, cicatrization may be secured by caustic applications.

In cases of permanent hypertrophy, the diseased gland should be extirpated.

Neoplasms of the Lachrymal Gland.—Morbidity growths, such as cysts and scirrhus, affect occasionally the lachrymal gland, and lead to displacement of the eyeball and double vision.

The treatment is the removal of the diseased gland.

Xeroma of the Lachrymal Gland.—Dryness of the lachrymal gland occasionally occurs. Its cause is unknown.

In this affection, the lachrymal secretion is either diminished or suppressed, and causes great inconvenience to the eye.

This disease is incurable; but it may be relieved by the occasional application of a few drops of liquor potassæ, diluted with an ounce of water.

Epiphora.—This disease is a hypersecretion of tears which arises from irritation of the lachrymal gland. They are thus caused to overflow, and run down on the cheek.

The treatment is the removal of the exciting causes, if possible. If we fail to afford relief, the lachrymal gland may be excised.

DISEASES OF THE LACHRYMAL PASSAGE.

Obstructions and Displacement of the Puncta.—Inflammation of the lining membrane of the lachrymal passages is the most common cause for their obstruction. Any cause which leads to obstructions of the tear-passage, or to its displacement, induces an accumulation of secretion

in the lacus lachrymalis. Tears are constantly accumulating upon the cornea, which at last overflow, and run down the cheek. Chronic conjunctivitis is not uncommon in this disease.

The lachrymal passage may be either partially or totally obstructed.

TREATMENT. — If obstruction of the lachrymal passage proves to be permanent, it should be gradually dilated by means of the ordinary Bowman's probe, or Dr. Williams's modification of the same.

Dacryocystitis Phlegmonosa. — Phlegmonous inflammation of the lachrymal duct commences, as a painful and hard swelling, at the inner angle of the eye.

When the inflammation advances, the skin is deep red, and tense; and the swelling extends to the eyelid, which often becomes œdematous, while the conjunctiva may also be affected.

By pressure on the swelling, nothing is evacuated on account of the occlusion of the opening of the lachrymal sac. Fever is not uncommon in the acme of this disease.

If the inflammation do not subside, suppuration takes place, and the abscess subsequently opens; after this, the inflammation disappears, and the swelling may subside.

Sometimes this process gives rise to fistula lachrymalis.

TREATMENT. — We must endeavor to limit the inflammation by an antiphlogistic treatment. Painting of the region, with a concentrated solution of nitrate of silver, has proved beneficial. If suppuration cannot be prevented, apply a poultice, and subsequently open the abscess in the

lower lachrymal point, if possible. After all treatment, should a fistula of the lachrymal duct remain, the normal passage must be kept open, if possible, by probing, and the fistula induced to heal.

Blennorrhœa of the Lachrymal Passage.—In this affection there is a roundish prominence in the internal angle of the eye. On pressure, the puncta lachrymalis evacuates a whitish glairy fluid. It is a chronic disease, which, after renewed inflammation, often terminates in fistula lachrymalis.

TREATMENT.—Open the sac by slitting up the lachrymal puncta, and keep it empty by frequent pressure with the finger. Apply an adstringent lotion to the eye, or by injection with Anel's syringe, in the lachrymal passage.

If the passage is obstructed, its dilatation with probes will be necessary.

Polypi and Concretions in the Sac.—Little polypi have been seen in the external orifice of the lachrymal duct. Calcareous concretions are also found obstructing the tear passage. Their removal is necessary.

DISEASES OF THE EYELIDS.

Ablepharon.—Deficiency of eyelids is either unilateral or bilateral. It is also either congenital, or acquired in consequence of wounds.

Plastic operations are the only treatment required.

Coloboma Palpebrarum.—Splitting of eyelids is unilateral or bilateral. It is also either congenital or acquired.

Plastic operations are alone required.

Anchyloblepharon.—Adhesions of the lids together are either partial or total, congenital or acquired.

Operative measures are necessary.

Phimosis Palpebrarum.—Phimosis of the lids generally occurs in consequence of chronic inflammation, or lesions of the lids.

Operative treatment is alone beneficial.

Symblepharon.—Adhesions of the lids to the globe is either partial or total. This is almost always produced by chronic inflammation, such as trachoma, or by traumatic causes.

Treatment, if advisable, is merely operative.

Lagophthalmos.—Hare-eye is the exposing of the globe, from shortening of one or both eyelids.

This defect is often acquired, but may be also congenital.

According to the cause, a spastic, a paralytic, and an organic form have been distinguished.

The treatment is sub-cutaneous injection of morphine, faradisation, and operative.

Blepharoptosis.—Ptosis, or falling of the upper lid, is either congenital or acquired.

Two forms have been distinguished :—

The *organic* form, caused by disease of the eyelid, and

the *paralytic* form, which is generally the consequence of nerve disturbance.

The treatment of the organic form depends on the disease that gives rise to this condition. The paralytic form requires faradisation, or operative treatment.

Epicanthus.—This rare disease is an excessive development of the integument of the inner angle of the lid.

It is either unilateral or bilateral, acquired or congenital; and is often complicated with ptosis and microphthalmos.

The treatment of the permanent forms requires an operation. Those caused by acute disease decline with its removal.

Entropium.—Inversion of the eyelids, which is of more frequent occurrence with the upper lids, is often partial or total. One or more lids can be affected.

The most frequent cause of this disease is cicatricial degeneration of the conjunctiva, connective tissue, and cartilage of the eyelid, the result of chronic trachoma. Spasm of the obicular muscle sometimes causes entropium.

Several degrees of inversion have been distinguished. In the highest degree, however, the lid appears actually doubled inward, or rolled inward upon itself.

The eye is kept in a constant irritation, and the result is often very dangerous.

TREATMENT.—The spastic forms of entropium mostly disappear after treatment. The others, depending on

organic changes of the lids, are only to be corrected by operation.

Ectropium. — Eversion of the lids is either partial or total, and affects the lower more than the upper lids.

It appears in several degrees; but in the highest degree the lid is totally everted, and the conjunctiva is kept in a constant state of irritation.

Eversion of the lids most commonly depends on traumatic causes.

Operative treatment is the only source for relief.

Tri-dis and Tris-tichiasis. — Inversion, or inward turning of one or more eyelashes, while the surface of the lids is in a normal condition, or a double row of eyelashes occurs very often, and is a source of great irritation to the eye.

The principal modes of treatment are extracting the inverted eyelashes by forceps, and their removal by operation.

Hordeolum. — Styes are small abscesses, which are formed in the ciliary border. At the summit of the tumor there is a suppurating point generally found. There is an itching sensation in the part, which soon becomes inflamed and painful. In other cases, there are scarcely any noticeable symptoms. This disease is common to scrofulous, or weakly constitutions.

TREATMENT. — Poulticing will often suffice; or the matter may be let out by a prick of the lancet. The internal use of cod-liver oil or iron is indicated.

Chalazion.—The meibomian cyst is a hordeolum, in which the proliferation of tissue has somewhat receded, and which has become permanent. It varies in size.

TREATMENT.—Evacuation of the contents of the cyst by a crucial incision through the conjunctiva into the tumor of the everted lid.

Milium.—Milium is an accumulation of sebaceous matter in a sebaceous gland of the lid, forming a little tumor.

If it is thought necessary to interfere with it, the contents can be easily squeezed out.

Blepharitis Phlegmonosa.—Phlegmonous inflammation attacks the upper lid more commonly. The lid becomes swollen, red, painful, and of a brownish color. The free movement of the lid is limited, or quite disturbed.

The termination is usually in abscess.

In the early stage, the application of a fomentation of chamomile-flowers may be made; or the inflamed part may be painted with the tincture of perchloride of iron, or with a saturated solution of the nitrate of silver.

If suppuration has already commenced, a cataplasm should be applied, and the abscess afterwards opened.

Blepharitis Erysipelatosa.—Erysipelas is but seldom limited to the lids. It is almost always the result of the propagation of erysipelas from the face. Its development is usually spontaneous, but may have a traumatic cause.

Erysipelas of the lids terminates generally in resolution. It is more or less complicated with conjunctivitis.

The local treatment is the same as in phlegmonous inflammation. The general system requires attention.

Blepharadenitis Ciliaris. — Inflammation of the follicles of the edges of the lids appears mostly after scrofula and syphilis.

Chronic neglected conjunctivitis may also become a cause of this disease. It begins with little pustules at the root of the cilia, which successively burst, and give rise to little crusts upon the margin of the lid, "tylosis."

Blepharadenitis often causes atrophy of the lashes, "madarosis," and produces, after their total destruction, the well-known "lippitudo," or blear-eye.

This disease is almost always complicated with conjunctivitis and dagryocystitis.

The local treatment is the removal of the scabs, and the application of diluted citrine ointment, or lapis mitis.

The constitutional treatment should be the same as that employed for those suffering from a syphiilitic taint, or scrofulosis.

Eczema Palpebrarum. — Eczema of the lids appears generally with eczema of the face, and is frequently caused by scrofulosis or syphilis.

TREATMENT. — Tonics, and the local application of zinc ointment, will generally prove sufficient.

Herpes, or Zoster Palpebrarum. — This disease affects the lids in the course of the distribution of the nerves. It is a very painful eruption, and is generally complicated

with conjunctivitis. Its duration is from two to three weeks.

TREATMENT. — Hypodermatic injections of morphia will quiet the neuralgic pain, or the application of an ointment of belladonna and opium, over the supra-orbital region. The conjunctivitis requires adstringent applications.

Warts, cancer, erectile, and other tumors, are developed upon the lids. Cancer appears generally on the internal angle of the lower lid.

The treatment is generally operative for these diseases. Erectile tumors should be injected with a solution of perchloride of iron, or of tannin.

DISEASES OF THE CONJUNCTIVA.

Conjunctivitis Simplex. — Hyperæmia of the conjunctiva has a direct or indirect cause. The conjunctival hyperæmia, which is caused by a direct irritation, as, for instance, foreign bodies, gas, &c., is particularly noticeable by the injection of the movable conjunctival vessels; while in an advanced stage of congestion, the conjunctiva necessarily loses its smoothness.

The principal symptoms are a sensation of sand in the eye, a little pain, and increased secretion of tears.

Every exposure of the eye increases these symptoms.

Congestion of the conjunctiva, depending upon an indirect irritation, such as is met with in diseases of the retina, choroid, or in those of accommodation and refraction, is

only a reflex action. In these cases it will always be noticed, that both the movable conjunctival as well as the not movable conjunctival vessels are highly injected; and that the latter are farther to be distinguished by their deep violet color, and their increasing in number as they approach the cornea.

The treatment of hyperæmia, secondary to other diseases, must be directed to the primary cause.

Hyperæmia excited by direct irritation, such as foreign bodies, gas, &c., requires only the removal of these causes in slight cases; but where the conjunctiva has lost its smoothness, the application of adstringents becomes necessary.

The protection of the eye in all cases with neutral colored glasses is desirable.

Conjunctivitis Catarrhalis. — The leading symptoms of conjunctivitis catarrhalis are redness, some pain and uneasiness in the eye, an increased discharge which is muco-purulent, and a sticking together of the eyelashes.

The redness is bright, or of a scarlet color, and usually irregular, or in patches. In intense inflammation, the whole surface of the eye, except the cornea, is scarlet-red. The vessels are large, tortuous, and can be moved about by the finger. A swelling of the conjunctival fold may extend towards the sclerotic, and cause chemosis.

The eye may be bloodshot by extravasated blood, caused by the rupture of the minute blood-vessels, "ecchymosis."

The increased secretion of tears and muco-pus is apt to collect between the lids, and give rise to a burning sen-

sation, and the feeling of tightness of the lids. This secretion is contagious.

There are numerous causes which induce catarrhal conjunctivitis, but it depends for the most part upon atmospheric influences; and not unfrequently we then noticed that the conjunctiva becomes rough, with a velvet-like appearance, on account of the development of its villous structure. This is the simple *granular conjunctivitis*.

The treatment is the removal of the cause, if possible.

Children suffering from this disease should not be crowded together in close apartments, or allowed to use the same towels, &c.

Local application of a solution of nitrate of silver, two grains to the ounce of water, and the use of blue glasses, are the best remedies. The adhesion of the lids can be prevented by smearing them at bed-time with any mild ointment, such as cold cream.

Conjunctivitis Pustulosa. — Pustular conjunctivitis is generally apt to occur in scrofulous constitutions.

The prominent symptoms are slight and partial redness, sometimes confined to the lining of the lids, great intolerance of light, little prominences or pustules on the conjunctiva, sometimes on the cornea, but generally at the junction of the sclerotic and cornea. A few vessels, collected into bundles, proceed from the circumference of the eye, especially the angles, to the edge of the cornea.

At the end of these vessels are situated the pustules, which consist at first of a simple elevation of the epithelium

by a collection of serum beneath it. Unless the pustules are situated on the cornea, the above-mentioned symptoms are of no great importance. But if there situated, the symptoms become more urgent. There is a dense vascularity, and a hazy state of the cornea, corresponding to the pustules; and the intolerance of light, and ciliary pain, is excessive.

The pustules may be absorbed, and leave a temporary white spot; or they may ulcerate, and, after healing, leave a permanent white speck.

TREATMENT. — The general health ought to be improved by suitable means, such as fresh air, cod-liver oil, iron, &c.

The pupil should be kept dilated with atropine, on account of the ciliary pain, photophobia, &c.

Conjunctivitis Exanthematica. — In acute exanthemata, as in small-pox, measles, and scarlet-fever, the conjunctiva is almost always affected. Conjunctivitis, or a simple hyperæmia, is seen in the beginning of the eruptive stage. In the majority of cases of measles and scarlet-fever, the conjunctivitis disappears as the disease declines.

Should ulceration of the cornea occur after small-pox, much precaution ought to be taken to prevent its destruction. The eye should be kept clean, and the pupil dilated with atropine. The ulceration of the cornea must be treated in the same manner as keratitis ulcerosa.

Conjunctivitis Purulenta. — Purulent conjunctivitis varies very much, according to its cause, and its intensity.

The hyperæmia, which extends all over the conjunctiva,

is of a dark red color. There is great swelling of the parts. The effusion beneath the conjunctiva bulges it out around the cornea like a ring, and forms such an impediment to the circulation, that ulceration and necrosis of the cornea often take place. The chemosis pushes the eyelids forward to such an extent as to entirely hide the eye: the upper lid becomes hard, and completely overhangs the lower.

Sometimes the lid is turned backwards on itself.

There is always an increased heat of the lids, much pain, and a more or less considerable quantity of mucopurulent secretion, which varies, according to the severity of the inflammation.

The principal danger of purulent conjunctivitis arises from the destructive effects it so often exerts on the cornea. When the disease has begun, it generally advances rapidly, and requires our whole attention.

In the majority of cases, this disease arises from contagion, such as gonorrhœa, and unhealthy secretions from the vagina, or purulent matter from the eyes of others thus affected.

Blennorrhœa is one of the destructive diseases of the eye, which, in spite of the most careful treatment, causes great injury to it, or completely destroys it.

TREATMENT. — Ascertain the exact state of the cornea, and protect the sound eye. In the mild cases, with no complication of cornea, the use of a solution of nitrate of silver, three grains to the ounce of water, in the eye every three hours may prove sufficient; and tepid fomentations of acetate of lead should be applied to the swollen eyelids.

In the intervals, the eye should be frequently washed out.

In the severe cases, with implication of the cornea, the application of a solution of nitrate of silver, varying in strength from ten to thirty grains to the ounce of water, on the everted conjunctiva of the eyelids, with subsequent washing of the lids, must be resorted to, once or twice daily. When, from swelling, the lids cannot be everted, weaker solutions may be dropped into the eye more frequently.

The discharge should be gently syringed out with a weak solution of alum. Atropine is beneficial in such cases.

Pure air, separation, and cleanliness are strictly necessary. In the treatment of children, great caution must be taken with the cornea, on account of the resistance they offer to the opening of the swollen eyelids.

Conjunctivitis Diphtherica.—In diphtheric conjunctivitis, there is a fibrous exsudation on the surface, as well as in the connective tissue of the conjunctiva. The eyelids become swollen, the conjunctiva is of a grayish-yellow color; while the inner surface of the lids presents a rough, or granulated appearance. The fibrous exsudation is firmly adherent to the conjunctiva. The whole system is generally affected at the same time. This is indicated by fever, &c.

Three periods are to be observed in the development of diphtheritic conjunctivitis:—

1st, That of a fibrinous exsudation of the conjunctiva, which commences with a severe pain, a sensation of heat

in the eyelids, and an augmented lachrymal secretion. The conjunctiva is infiltrated with a fibrinous exsudation of a yellowish color, with tumefaction of the lids. The chemosis of the ocular conjunctiva appears marbled, from the numerous patches of ecchymosis.

2d, That of purulent secretion. The hardness of the lids disappears, the conjunctiva is less swollen, and has a spongy aspect. The fibrinous exsudation detaches itself, and causes a profuse purulent discharge. The cornea often loses its brightness; and the purulent secretion may lead to destruction of the cornea.

3d, That of cicatrication of the tissue. In this period, the conjunctiva is retracted by the formation of a cicatricial tissue. The amount of this tissue depends upon the severity of the fibrous infiltration of the conjunctiva. Often this produces entropium, and may become subsequently a permanent irritation to the eye.

The greatest immediate danger of this disease is from lesion of the cornea.

TREATMENT. — In the first stage of the disease, the only rational local treatment is frequent fomentations of cold water on the lids. As soon as the second stage sets in with a purulent discharge, cauterization of the conjunctiva on the everted lid, with a concentrated solution of nitrate of silver, and subsequent washing out, is necessary. A solution of sulphate of atropine, two grains to the ounce of water, should be dropped into the eye three times a day.

When degeneration of the cornea is feared, a solution of carbolic acid, one to two drops to the ounce of glycerine, applied to the eye, will generally arrest it.

A good diet, and the use of tonics, such as the perchloride of iron, are also indicated.

Every other precaution ought to be taken, as noticed for purulent ophthalmia.

Conjunctivitis Granulosa, or Trachoma. — By trachoma granulation is understood a greater or less number of eminences, differing in their nature, which are found scattered in the tissue of the conjunctiva.

The conjunctival granulations are distinguished into two kinds, according to their aspect and their structure.

These are the *vesicular* and *carneose*, or papillary, granulations.

The first development of the vesicles is noticed in the palpebral fold of the lid, in proximity to the external angle of the lower eyelid, as a number of small, white, transparent prominences, standing either grouped together, or some distance apart, and frequently spreading themselves all over both eyelids, and the place of junction of the scleral conjunctiva with the cornea.

On the first development of the vesicles, the conjunctiva appears anæmic; but occasionally vessels may be seen running into the vesicle. When the vesicles are fully developed, then the conjunctiva becomes swollen and injected; the vesicles increase in size, and lose their transparency; the eyelid projects from the eyeball; while the swelling of the conjunctiva causes pressure and subsequent flattening of the vesicles in such a manner, that they encroach upon one another, and, owing to their yellow color, resemble the "spawn of frogs."

At any of the stages of development, the vesicles can remain stationary, with symptoms of photophobia and keratitis; or they may be wholly absorbed, only leaving as many little white atrophic spots as there were vesicles.

The other kind of granulations is particularly to be distinguished by the fleshy aspect of the hypertrophied conjunctiva. It usually appears on the palpebral fold of the upper lid. The palpebral fold is then very vascular and intensely swollen, and there is a more or less mucopurulent discharge of a contagious character. If the lid is everted, the palpebral fold is pressed forward, and the granulations can be seen.

According to the development and intensity of the inflammation, the granulations become more diffuse, and take on widely different aspects. In the course of this disease, the lachrymal duct often becomes obstructed, and the cornea affected.

In the severe form of granulations, which is usually chronic, the cartilage participates in the inflammation, is relaxed, and the trachoma terminates sooner or later in atrophy of the affected tissues, while the diseased cartilage adds to the formation of entropium, and phymosis of the lids.

Absorption but rarely takes place in papillary granulations; more frequently they have a chronic termination.

TREATMENT.—When the granulation vesicles are anæmic, it is rational not to interfere much with them.

If irritation sets in, and the vesicles are discrete, each of them should be touched with lapis mitigatus.

If they are spread all over the conjunctiva, the entire

membrane must be likewise treated, and subsequently washed with water.

In the other kind of granulations, the lids must be everted, that the cornea may not be unnecessarily affected by the application of strong solutions of nitrate of silver, or the crystals of copper, to the diseased part.

If the cornea is implicated in the disease, with ciliary pain, the local use of a solution of atropine is required.

When trachoma makes its appearance in crowded institutions of any kind, frequent examinations should be made, and the affected patients separated from the others. Pure air and cleanliness are also very necessary.

Xerophthalmia. — Xerophthalmia is a dry condition of the conjunctiva. It is due to deficiency of its natural secretions, in consequence of long continued irritation.

The entire conjunctiva is shrunken, and there is loss of transparency of the cornea.

TREATMENT. — This condition is incurable. Frequent applications of glycerine, or any other mild oil, afford the only relief.

Pterygium. — This is a simple hypertrophy of the conjunctiva, and its subcellular tissue. It is of a triangular shape, often very vascular, with its base turned towards the outer orbital angle, and its apex on the margin, or towards the centre of the cornea. There are many varieties of this affection.

Its treatment is operative ; removal either by ligature, or by dissection.

Hæmorrhagia Conjunctivæ.—Effusion of blood in the conjunctiva has different causes. It occurs after injuries, and is also of a spontaneous origin. The ecchymosis takes place in the subconjunctival tissue.

TREATMENT. — Spirit fomentations of arnica or rosemary are used to provoke absorption of the effused blood.

When the ecchymosis occurs in consequence of pertussis, remedies must also be directed to that disease.

Læsiones Conjunctivæ.—Injuries of the conjunctiva are caused by foreign bodies lodged in the conjunctiva, such as sand, glass, lime, wood, &c., which produce irritation and subsequent inflammation.

TREATMENT. — Removal of the foreign bodies. When the injury is caused by lime, the eye should be washed very thoroughly, and almond oil or olive oil may be subsequently applied. A solution of sulphate of atropine may be required in severe cases.

Neoplasmata Conjunctivæ.—Pathological new formations have their seat in the conjunctiva itself, or in the subconjunctival tissue.

These are cysts, polypi, warts, cancer, fibrous tumors, &c. They require operative treatment.

DISEASES OF THE CORNEA.

Keratitis.—Although the cornea does not essentially consist of a vascular tissue, nevertheless, in consequence

of inflammation, the vessels which it derives from the neighboring tissues become developed upon it.

The changes to which keratitis gives rise, are partial or total, and may be limited to the superficial, or extend to the deeper layers, of the cornea. Ordinarily, one portion of the cornea is more affected than another. In the acute form, many minute vessels are developed in the circumference of the cornea, and extend upon it. The vascularity varies according to the intensity of the disease; and the opacity of the cornea depends upon the amount of change which takes place in its tissues.

The most marked symptom is dimness of vision, with occasional lachrymation and photophobia.

Keratitis has a tendency to relapse, especially when it depends on constitutional dyscrasiæ.

TREATMENT. — When this disease depends on foreign bodies, they should be removed, and the subsequent irritation allayed by cold water applied constantly, and the introduction of a drop of a weak solution of atropine into the affected eye.

When keratitis depends on constitutional influences, the treatment will vary with the cause. A generous diet is always indicated.

A blister behind the ear, of the same side, will often be of great service in recurrent keratitis.

Keratitis Punctata. — This disease consists of spots of a grayish color, scattered on the posterior surface of the cornea. The natural transparency of the cornea is lost, and it has a hazy appearance. There is but slight con-

gestion, and it is generally limited to a little injection of the episcleral tissue surrounding the cornea. Pain and photophobia form only subordinate symptoms in this disease. The patient alone suffers from dimness of sight. This disease may extend to the deeper structures of the eye, and give rise to severe symptoms, such as in irido-choroiditis.

Keratitis punctata is generally due to constitutional causes. It may terminate in absorption, or take a chronic course.

The treatment consists in tonics and liberal diet, and is similar to that of keratitis in general.

Keratitis Ulcerosa. — Ulceration of the cornea is almost always seen in its circumference. The base of the ulcer may be clear, or the seat of a plastic exsudation. The forms of the ulcer also vary. Vascularization either exists or not, on the ulcerated cornea. Generally, however, there are injected sclerotic vessels, around the cornea, which extend to the ulcerating spot.

When the ulcer on the cornea is progressing, it assumes a rough and hazy appearance. If the ulcer is limited to the superficial layer, no great change takes place; but, on the contrary, if the deeper layers are affected, the iris may be involved, project, and form a hernia of the cornea. There always will remain, on the place of ulceration, a more or less permanent opacity in the tissues of the cornea, which may give rise, according to its seat, to impaired vision.

Severe pain, extending to the neighboring parts, photo-

phobia, epiphora, and vascular injection of the eye, are the principal symptoms which accompany this affection.

The treatment, in this disease, must be of a generous character, as regards the diet.

For the local treatment, dilation of the pupil with atropine, and the closing of the eye, will be sufficient in most cases. If the ulceration extends to the deeper layers, with almost no vascular injection, careful cauterization of the ulcer will be indicated.

In cases, finally, where the iris forms a hernia in the cornea, paracentesis of the cornea is advisable; atropine must be applied, and the eye bandaged.

If, after every proper means has been tried, the cornea happens to become perforated, and prolapsus of the iris occurs, this must be snipped with the scissors.

The same treatment should be pursued still in regard to the use of atropine and the bandage.

Keratitis Suppurativa. — Suppurative keratitis varies in the degree, and the severity of its symptoms, according to its cause. The pain is often excessive in the affected eye. There is photophobia, and an increase of tears. The conjunctiva is intensely red, while the cornea itself is hazy. Subsequently, an abscess is formed between its layers; and generally the external layers of the cornea give way, and form an excavated ulcer. Sometimes, however, the internal or posterior layers of the cornea are also ruptured; and pus escapes into the anterior chamber, "hypopion."

When the abscess is superficial, it may disappear with but slight injury to the cornea. Deeply excavated ulcers

cause permanent cicatrices. When the tissues of the cornea are infiltrated with pus, it gives rise to more serious results.

TREATMENT.—When the cause is local, it should be removed, if possible.

When suppuration begins in the cornea with inflammatory symptoms, it requires an antiphlogistic treatment, such as cold applications, and leeches to the temple. A solution of atropine should be dropped several times daily into the eye.

Subcutaneous injections of morphine, when the affection is very painful, will also be of service.

When an abscess is developed in the cornea, and is painful, warm compresses of chamomile tea, temporarily applied to the eye, will ordinarily relieve the pain, while the abscess must be opened as soon as possible. The repeated use of atropine in the eye, together with the application of a compress bandage, will be necessary.

When hypopion takes place in the anterior chamber, and is accompanied with pain, its evacuation is necessary. Atropine, and a bandage, are also indicated. Subcutaneous injection of morphine may become necessary.

Pannus.—This affection is a vascular opacity of the cornea, which is developed in its superficial layers, without any alteration of the proper tissue of this membrane.

Irritation of the cornea by contact with a rough surface, such as takes place in granular conjunctivitis, must be considered, together with trichiasis and entropium, as the most frequent cause of this disease.

According to the intensity of vascularization, there is a variety in the appearance and extent of this vascular opacity of the cornea.

The symptoms, which more or less accompany this condition, are an overflow of tears, photophobia, and pain. The disease has a chronic course, and it is often uncertain as regards the result.

The more recent and thinner the pannus is, the more favorable is the prognosis.

TREATMENT. — This must consist in the immediate removal of the exciting cause, if possible, such as entropium and trichiasis.

If this vascular opacity of the cornea is produced by granulations, it generally disappears under a suitable treatment for that condition.

If it results from cicatricial shortening of the eyelid, it will be necessary to elongate the palpebral fissure by operation, in order to prevent friction of the eye.

If, finally, pannus does not yield to the above modes of treatment, inoculation with pus in the affected eye may be tried.

Staphyloma Corneæ et Iridis. — Staphyloma is an abnormal protrusion of the cornea and iris, with loss of transparency of the cornea.

This disease occurs in consequence of inflammation, by which the structure of the cornea is destroyed. When the destruction of the corneal tissue from ulceration extends to the anterior chamber, the iris becomes entangled and adherent in the perforation. The diseased tissue offers

less resistance to the distending power of the aqueous humor of the eye than in its normal condition, and thereby forms a partial or total staphyloma.

The staphyloma varies in size, and remains either stationary, or forms protrusions in other places, in consequence of ulceration of the cornea. The tumor may burst open, and cause the escape of the contents of the eye, and subsequent atrophía bulbi.

Impairment of vision is the most prominent symptom in staphyloma, and varies with the degree of the protrusion.

TREATMENT. — If the protrusion is small and partial, paracentesis of the cornea, and its subsequent compression with a bandage, are indicated.

In obstinate cases of this kind, snipping of the staphyloma, followed by bandaging of the eye, will be useful.

If the pupil is nearly closed, iridectomy is very serviceable in the part of the cornea which remains transparent.

If the staphyloma is extensive, protruding between the lids, its removal by excision is advisable.

Obscuratio Corneæ. — Disturbances in the transparency of the cornea occur secondarily, as the result of inflammation. The extent of the opacities depends on the number of layers that are affected, and the peculiar condition of the exsudation. Hence the different names, such as *nebula*, *albugo*, *leucoma*, &c., given to them.

When these opacities are central, the amount of impairment of vision is the greatest.

TREATMENT. — The treatment consists in promoting absorption and exfoliation. For this purpose, various

remedies have been used with different results, such as laudanum, the white and red precipitate ointment, calomel, &c. ; while, recently, the sulphate of soda has been highly recommended.

Keratoconus. — Conical staphyloma is characterized by the partial or total protrusion of the cornea, without loss of its transparency.

Permanent impairment of vision is consequent upon this disease. The most prominent symptom is myopia. This is complicated, in the advanced stages of the disease, with opacity of the cornea, and subsequent astigmatism.

The sclerotic is also involved in most cases of conical staphyloma of the cornea.

TREATMENT. — The anomalies of refraction must be corrected, if possible, with concave glasses in myopia, and cylindrical glasses in astigmatism.

Iridectomy, with subsequent compression of the eye with a bandage, should be recommended where the disease is advancing.

The nutrition of the patient must be improved by tonics. Ordinarily, but very little, if any, success can be expected in advanced cases.

Injuries of the Cornea. — Wounds of the cornea may be caused by different kinds of implements, and are distinguished according to their forms and extension.

Non-penetrating wounds of the cornea are less frequently apt to occur than penetrating ones. When there is simple abrasion, or loss of the epithelium of the cornea, its repro-

duction generally takes place with but slight irritation of the eye. The greater the loss of substance, the greater is the irritation, and its danger.

Incised and penetrating wounds of the cornea are to be considered as the most dangerous, in consequence of complication with the deeper layers of the eye. Those in particular of the iris and the lens may cause prolapsus iridis, or a traumatic cataract. Such complications are almost always accompanied with serious irritation and pain of the eye, and frequently lead to its destruction.

When foreign bodies have penetrated some of the layers of the cornea, a more or less uneasy feeling, and considerable irritation exist, such as photophobia, pain, and an overflow of tears.

Often, however, the foreign body penetrates all of the layers of the cornea, and locates itself in the deeper structures of the eye. This accident often leads to most serious results, caused by general inflammation of the eye.

TREATMENT. — As a general rule, we must endeavor to prevent serious inflammation by a suitable antiphlogistic treatment.

Superficial abrasions of the cornea usually heal under the simple application of any mild oil to the eye.

A more substantial loss of the corneal tissue will require an antiphlogistic treatment, and the local use of atropine.

In large uncomplicated incised wounds, their careful union with fine silk, and subsequent compression by bandaging, are necessary. The local use of atropine in the eye is also advisable.

In small complicated wounds, with prolapsus iridis, the iris must be reduced, if possible ; if not, the protruded part ought to be snipped, and a compressing bandage applied with the use of atropine.

The more severe complicated wounds are to be treated according to circumstances.

When foreign bodies penetrate the cornea, their immediate removal is necessary.

When they have penetrated through the deeper structures of the eye, and cannot be removed, sooner or later, enucleation of the eyeball will be necessary, in consequence of the sympathetic irritation of the other eye.

Morbid Growths.— These are similar to those of the ocular conjunctiva, from which they generally originate.

Arcus Senilis.— This affection, which appears in old age, is a grayish or even tendinous opacity of the borders of the cornea. It forms a cloudy ring, more distinct at its superior and inferior segments. The outer margin of the conjunctiva remains unaffected. Beyond this, there is a ring of clear cornea, about half a line broad. This disease is considered a fatty degeneration of the cornea, which usually accompanies fatty degeneration of the blood-vessels.

A tonic treatment is always indicated, to support the nutritive power in old age.

DISEASES OF THE SCLEROTIC.

Scleritis.— It is uncertain if inflammation of the sclerotic ever occurs uncomplicated. It is generally observed to accompany inflammation of the neighboring parts, either the iris or choroid.

As scleritis depends on other diseases, it must be treated accordingly.

Sclero-Choroiditis Anterior. — Scleral staphyloma is noticed as a projection of the sclerotic. Its color and form vary, according to its intensity. It is the result of an abnormal intra-ocular pressure, caused by degenerative changes of tissues in consequence of inflammation or injuries.

When this disease is caused by inflammation of the ciliary body, the same symptoms exist as in irido-choroiditis.

The amount of vision then depends upon the changes which have taken place in the membranes of the eye.

Injuries of the sclerotic, near the ciliary region, may cause prolapsus of the ciliary body, and also terminate in staphyloma, unless seasonably prevented.

They not unfrequently terminate with the total loss of sight.

TREATMENT. — Nothing can be done in the degenerative form of sclero-choroiditis anterior.

If the staphyloma is caused by inflammation of the ciliary body, an antiphlogistic treatment, as in irido-choroiditis, is indicated.

In cases of wounding of the sclerotic, with subsequent prolapsus of the ciliary body, the latter must be snipped off, and the lips of the wound securely united with fine silk sutures, and the eyelid carefully closed. If inflammation follows, antiphlogistic treatment will be required.

In any case of a large staphyloma anterior, with destroyed vision, which is the cause of sympathetic ophthalmia, excision or enucleation of the eyeball is indicated.

Morbid Growths.—Pathological new formations are of rare occurrence in the sclerotic tissue. It becomes secondarily involved, however, by tumors, which have their origin in neighboring parts.

DISEASES ON THE IRIS.

Irideremia.—Absence of the iris may be partial or total. This disease is generally congenital. The acuteness of vision is much impaired in this affection. It is often complicated with nystagmus, strabismus, and central cataract.

This disease may be corrected with black glasses, having transparent centres.

Mydriasis.—This is an abnormal dilatation of the pupil, principally caused by paralysis of the oculomotor nerve, or irritation of the sympathetic nerve.

Mydriasis may also be artificially procured with atropine, stramonium, hyoscyamus, &c.

TREATMENT. — If this disease depends on impaired function of the oculomotor nerve, faradisation must be applied.

If it depends on reflex action of the sympathetic nerve, such as is produced by intestinal worms, &c., the treatment must be adapted to this condition.

If produced artificially by atropine, &c., the calabar bean will counteract it.

Myosis. — Abnormal contraction of the pupil may be caused by reflex action produced by light, by functional disturbance of the sympathetic nerve, or by synechiæ.

When it depends on functional disturbance, both eyes are likewise affected.

Hippus, moreover, is a spasmodic condition of the iris, consisting in frequent dilatation and contraction of an involuntary character. This generally depends on irritation of the retina.

The treatment consists in the removal of the causes, if possible.

Iridodonesis. — Tremulousness of the iris occasionally occurs after hydrophthalmus anticus, and also in consequence of dislocation or removal of the lens.

This condition is incurable.

Synechia. — This is a partial or total adhesion of the iris to the anterior capsule of the lens, or to the cornea.

Accordingly, we distinguish an anterior and posterior synechia.

The vision is more or less impaired, and depends on the degree of adhesion.

TREATMENT.— This varies in the different cases.

Where the vision is but little impaired, it will be irrational to interfere. Atropine only, may be tried to rupture the adhesions.

When the adhesions are distended, and are the cause of much impairment of vision, iridectomy must be performed.

Solutio Iridis. — Detachment of the iris from its ciliary border may occur from any injury, and the iris may be partially or totally detached.

It is a serious cause of impairment of vision.

Læsiones Iridis. — Wounds of the iris cause serious inflammation of that organ. They are produced by a variety of implements, and differ only in the degree of injury to the organ, and the adjacent structures.

Their treatment is the same as that in iritis and its complications.

Corpora Aliena. — Foreign bodies may become impacted in the iris, and even penetrate this membrane.

Their removal, if possible, is absolutely necessary for the permanent safety of the eye. Unless these bodies are removed, sympathetic irritation of the other eye is the invariable consequence.

Hyperæmia Iridis. — Hyperæmia of the iris is only the early stage of iritis, and is usually dependent on injuries or diseases of the cornea or choroid.

It is characterized by a ring of finely injected vessels at the junction of the sclerotic and cornea. There is seldom any pain in the eye, but more or less dimness of vision.

The treatment of this condition will be considered under that of iritis.

Iritis. — Inflammation of the iris gives rise to different symptoms, according to the degree to which the disease has advanced. It is acute, chronic, or recurrent.

The principal symptoms are as follows: Ciliary pain, extending to the supra-orbital region, which varies, both in intensity and duration; intolerance of light and lachrymation, a contracted pupil, congestion of the conjunctival vessels, with injection of the sclerotic zone, changes in the color of the iris, dimness of vision, and a more or less increased tension of the eyeball.

The changes which take place in the iris and its surrounding structures, depend on the degree and the duration of the inflammation.

When there is serous exsudation or hyperplasia as the result of inflammation, we have new formations of a fibroplastic character, which cause total or partial adhesions between the lens and iris, "synechia posterior." When iritis is of a more serious character, and suppuration ensues, the iris presents a yellowish color, in consequence of minute quantities of pus collected on different parts of its surface. This may gravitate so as to form an accumulation of pus in the aqueous humor, "hypopion."

In iritis, which occasionally accompanies prosopalgia, of which I have seen two cases, the pain is so extensive and urgent, as to make the patient despondent.

Under the influence of large doses of opium, however, and subcutaneous injections of atropine daily, the prosopalgia in both cases gradually subsided, and subsequently the iritis.

After injuries, syphilis and rheumatism are the most frequent causes of iritis.

Syphilitic iritis is particularly distinguished by irregularities in the shape of the pupil, and the other manifestations of syphilis.

Iritis, however, in new-born infants, who are the subjects of hereditary syphilis, is of extremely rare occurrence.

TREATMENT.—Where foreign bodies are the cause of iritis, they are to be removed, and the pupil kept dilated with a solution of atropine.

If sympathetic irritation is excited in the other eye, and the removal of the foreign body is impossible, enucleation of the eyeball is our only resort.

In cases of chronic or recurrent iritis, iridectomy effects relief.

In all cases where the inflammation indicates an antiphlogistic treatment, leeches should be applied to the temple, and opiates administered to allay pain.

When total atresia of the pupil takes place, or the impairment of vision is due to other forms of synechia, iridectomy must be performed, if the atropine fails to dilate the pupil.

In syphilis and rheumatism, our remedies must be selected with reference to those diseases.

INFLAMMATION OF THE CILIARY BODY.

Cyclitis. — This not uncommon disease is always complicated with disease of the choroid and iris, as the ciliary body is an immediate continuation of the choroid. It is then distinguished as irido-choroiditis, or irido-cyclitis. The exsudation to which it gives rise, is either of a plastic character, or serum alone is secreted between the ciliary body and the vitreous, or between that body and the sclerotic, and may be a cause of staphyloma of the sclerotic.

Its symptoms are those of iritis, or choroiditis.

In consequence of the accumulation of the exsudation, the ciliary zonula of the iris is often bulged forwards; while the pupil appears depressed, as if adherent to the capsule of the lens.

The vision is more or less impaired on account of exsudative iritis, and inflammatory opacity of the vitreous humor.

The course of this disease is materially influenced by its complications; and the treatment must be similar to that of iritis and choroiditis.

DISEASES OF THE CHOROID.

Hyperæmia. — The great vascularity of the choroid itself, and its seat in immediate proximity to the retina, renders it obvious that disease of the choroid must often be associated with that of the retina.

Hyperæmia of the choroid is both active and passive. Passive hyperæmia is much more frequent in consequence of disturbances in the venous circulation of that membrane.

Hyperæmia produces dimness of vision, frequently scintillations of bright sparks in front of the eye when in the dark, and a feeling of distension of the eye. These symptoms are often very slight.

Ophthalmoscopic examination of the eye frequently shows congestion of the choroidal vessels, and often more or less opacity of the vitreous.

This disease is caused by disturbances in the circulation, and often by defects of the accommodation.

TREATMENT. — Particular attention must be given to the cause, in the treatment of this disease. Rest, counter-irritation, and cold water douches are indicated.

If caused by an error in the accommodation, this ought to be corrected by the use of suitable glasses.

Choroiditis Acuta. — The symptoms of acute choroiditis are hyperæmia of the conjunctival vessels; intense injection of the scleral vessels, which extend to a zone of fine capillary network in the place of junction of cornea and

sclerotic ; loss of brightness of the cornea, and more or less dilatation of the pupil.

The above symptoms are accompanied by photophobia, increased lachrymation, ciliary pain, which extends to the supra-orbital region, and tension of the eyeball. The patient is much troubled by brilliant iridescent sparks, even if he shuts his eyes.

Ophthalmoscopic examination of the eye in these cases shows great congestion of the retinal and choroidal vessels, a hazy appearance of the vitreous, and œdema of the retina.

In the course of the disease, impairment of vision takes place, which becomes aggravated with its severity.

When the congestion becomes urgent, not unfrequently rupture of the choroidal vessels happens, and causes extravasation of blood into the choroid, which generally appears in patches of different sizes.

If the inflammation of the choroid becomes diffuse and still advances, it may ultimately terminate with suppuration of the choroid, which generally extends to the anterior chamber, and finally destroys the eye.

The principal causes of acute choroiditis are injuries to the eye.

Choroiditis more commonly runs a chronic course, and is dangerous on account of the transformations which take place in the different tissues of the eye ; and more so, from the extensive detachment of the retina, which it is liable to produce.

When choroiditis disseminata occurs in consequence of chronic choroiditis, the impairment of vision is not so

marked a symptom in its early stages. An ophthalmoscopic examination, however, will discover one or more pigmented atrophic patches in the choroid. They often vary in size and shape. Retinal vessels may be seen running over them. In the more advanced cases, small flocculi floating in the vitreous may be seen, under which circumstances the sight diminishes.

The most frequent cause of this disease is syphilis.

TREATMENT. — This will vary with the cause.

When the disease depends upon the presence of foreign bodies, they should be removed, where practicable; in extreme cases, excision of the globe may be required.

In acute choroiditis from other causes, rest, counter-irritation, leeches, and cold compresses to the eye; atropine dropped in the eye, an ointment of opium and belladonna smeared on the supra-orbital region, — will often cause the inflammation to subside.

In the most urgent cases, iridectomy, and the use of opiates to relieve pain, are advisable.

In cases where syphilis is the cause of the disease of the choroid, a tonic treatment is necessary, and iodide of potassium must be administered.

Choroiditis Tuberculosa. — Tubercular matter in the choroid appears as prominent patches in the region of the ora serrata.

Impairment of vision is the most prominent symptom.

The disease is said to be of a scrofulous or syphilitic origin.

A tonic treatment is indicated, and iodide of potassium should be administered.

Wounds and injuries to the choroid are almost always accompanied with serious complications.

Wounds of the choroid never occur alone: they are always complicated with that of the sclerotic.

Blows upon the eye may cause more or less severe hemorrhage into the choroid and other membranes, with consequent impairment of vision, to a greater or less extent.

TREATMENT. — In recent cases, rest, with the application of ice to the eye, is advisable.

Tumors of the Choroid. — If the choroid is the seat of malignant growths, enucleation of the eyeball is the only relief.

Albinismus. — This condition is caused by the absence of pigment in the choroid and the uvea.

The use of smoky-colored glasses will remedy this deficiency.

Sclero-choroiditis Posterior. — Posterior staphyloma is situated in proximity to the optic disk. It is a generally known fact that subjects attacked with this disease are myopic.

With the ophthalmoscope we may generally observe, when the disease is a little advanced, that the external and inferior circumference of the optic disk is limited by some pigment and a half-moon-like segment, the strong whitish color of which makes a contrast with that of the nerve.

In more advanced cases of the disease, this whitish

atrophic patch becomes extended around the optic disk. In some instances, this disease may remain stationary throughout life. In others, it may progress; and it is not uncommon to have internal hemorrhage, which later terminates with circumscribed atrophy. During the progress of this disease, the field of vision is contracted in various degrees, and the eyes become easily congested.

TREATMENT.—The patient must not overstrain the sight with work; and, if there are symptoms of congestion, a cold eye-douche, frequently repeated, and purgatives, are indicated.

Where myopia renders it necessary, suitable concave glasses must be procured.

If the disease progresses, a tonic treatment may be beneficial.

Glaucoma.—This term is usually applied to chronic glaucoma, since acute glaucoma is considered in reality as only acute choroiditis. This disease derived its name from the greenish appearance observable through the pupil.

Symptoms.—The patient complains of seeing luminous particles, and a halo surrounding the light; of periodic pain in the eyeball, which is often sensible to pressure; and of an uneasy feeling in the region of the eyebrows. There is weakness of sight, which seems better in the morning than in the latter part of the day.

Failure of sight increases gradually with the process of the disease. The pupil also enlarges, and becomes immovable, often irregular in shape, and the iris is apparently of a green color. The tension of the eyeball is augmented.

The cornea loses its brightness, and the aqueous humor becomes less transparent. On the sclerotic are tortuous, large conjunctival and sub-conjunctival vessels, which give it a yellowish-gray color.

The sensibility of the cornea often diminishes, and not unfrequently a cataract is formed.

On examining the eye with the ophthalmoscope, we find the retina hyperæmic, and its veins tortuous and enlarged, while the arteries are contracted. Pulsation of the vessels is usually to be seen.

On the edge of the papilla, the vessels are apparently separated from their trunks.

The margin of the choroid is prominent, and the optic nerve presents a depression in its disk, "optic excavation." The structure of the nerve becomes gradually altered, and its margin appears more prominent. A hazy condition of the vitreous is frequently to be observed.

Glaucoma varies considerably in its development. Often it is rapid in its course, at other times it is gradually developed, and not unfrequently it remains stationary. The symptoms do not always follow the same order.

This disease is said to occur more in women than in men. Its causes are very obscure.

TREATMENT. — Iridectomy is the only treatment which has given satisfactory results.

DISEASES OF THE RETINA AND OPTIC NERVE.

Hyperæmia Retinæ. — When congestion of the retina takes place, we shall observe, by the use of the ophthalmoscope, that the vessels of the retina and the optic disk are augmented in number and in size. As there is not unfrequently a great variety in the number and size of these vessels, the diseased eye must be compared with the sound one.

The patient complains of *muscæ volitantes*, and a feeling of pressure in the eye.

However hyperæmia may often pass unnoticed, it may also become a source of great mischief when it takes a chronic course. Its existence may be due to a variety of exciting and constitutional causes, which have an influence upon its termination.

If early noticed, the disease may be arrested by a suitable treatment, which will be indicated by the different causes to which the disease may be due.

Retinitis. — This disease takes an acute and a chronic course, and is often complicated with iritis and choroiditis. When acute inflammation of the retina occurs, the patient complains of sparks of light in his field of vision, intense photophobia, lachrymation, dimness of vision, and pain in the eye, which often becomes very severe.

By ophthalmoscopic examination, if possible, we shall observe the optic disk and the retina deeply congested, the retina œdematous and swollen, the vessels tortuous and enlarged, and not unfrequently hemorrhage.

When retinitis takes a chronic course, the urgent symptoms of pain, photophobia, and lachrymation subside gradually; but the impairment of vision is aggravated by subsequent complications, which are usually apt to take place.

Retinitis may have for its cause either injuries or syphilis.

When syphilis is the cause, the inflammation is generally circumscribed; and patches of exsudations may be observed on the affected part, with the ophthalmoscope.

TREATMENT.—In all cases of retinitis, absolute rest and a dark room are required.

When retinitis depends on injuries, a suitable anti-phlogistic treatment is indicated.

When it results from syphilis, a tonic treatment, and the use of iodide of potassium, should be prescribed.

The intolerable pain, and consequent sleeplessness, will be relieved by bromide of potassium, or the use of hypodermic injections.

Hæmorrhagia Retinæ.—This condition is caused by the rupture of one or more vessels in the retina.

The hemorrhage may take place into its tissues, or between these and the vitreous; probably also between the retina and choroid. The extravasation may be circumscribed or diffuse, and have, for a result, detachment of the retina.

The disturbance of vision is variable, and depends on the seat and the extent of the hemorrhage.

Absorption may take place. The disease, however,

generally terminates with more or less change in the tissues of the retina, in the seat of the extravasated blood, and becomes a permanent cause of impairment of vision.

Tumors of the Retina.—The kind of tumor which always affects the retina is the *glioma* (Virchow), the *fungus hæmatodes*, and *medullaris*.

These pathological growths are apt to progress, and to result in destruction of the sight.

Children are more liable to this disease.

Enucleation of the diseased eye is the only relief.

Solutio Retinæ.—Detachment of the retina from the choroid is either partial or total. When partial, it is almost always at the lower part. The separated part of the retina appears more or less cloudy and relaxed: it projects forward in the eye, and waves with every motion. Often it escapes observation, when but slightly detached and transparent; but, by following the retinal vessels, as they emerge from the optic disk, it will soon be discovered. When total detachment takes place, the retina is quite cloudy, and moves freely in all directions.

This affection may be caused spontaneously in posterior staphyloma, external injury, as blows, wounds, &c.; but generally it depends on accumulation of fluid between the retina and choroid.

The subjective symptoms depend on the cause which gave rise to the detachment; but generally the patient complains of more or less impaired vision.

TREATMENT.—When detachment of the retina is caused

by accumulation of fluid, it is generally followed by unsatisfactory results. Evacuation, however, of the fluid, by an operation, is recommended.

When it is caused by injuries, an antiphlogistic treatment must be adopted. The injured eye should be closed, and absolute rest recommended.

Retinitis Pigmentosa. — In this disease, the only noticeable symptom is gradual impairment of vision, which is more marked after sunset.

Ophthalmoscopic examination shows, in the commencement of the disease, small, irregular brown or black spots of pigment scattered very generally over the retina in the course of the vessels; while the optic disk, and the vascularity of the retina, undergo no change. In an advanced stage of the disease, the optic disk becomes pale, and its vessels contracted, as do also those of the retina. The fundus oculi is paler, and numerous small black spots, with prolongations like bone-corpuscles, are scattered over it.

This disease is hereditary, and is said to be most common in consanguine marriages.

Hemeralopia usually exists for years. General impairment of vision only occurs after years of suffering.

This form of retinitis is incurable.

Achromatopsy, or Daltonism. — Color-blindness is a congenital imperfection of vision, which renders the person thus affected more or less incapable of distinguishing colors.

Where this exists to a considerable degree, only the

primary colors are distinguishable. In some cases, even black and white are only capable of being recognized. This is known as absolute color-blindness.

Blindness to certain colors is a more common form of the disease. Thus, certain persons only recognize yellow ; others, yellow and blue ; some are incapable of distinguishing red ; others, still, recognize yellow, red, and blue, but confound the different combinations of the primitive colors. Thus, for instance, orange appears yellow, and violet appears blue. All the intermediate varieties of color are lost.

The great frequency of this imperfection is an inconvenience in many occupations, such as that of florists, decorators, mantua-makers, &c.

The absolute necessity of being able to recognize colors is imperative in the case of pilots, engineers on railways, or others, whose business it is to observe colored signals.

It is important, therefore, to ascertain previously, whether persons so to be employed, are the subjects of this defect of vision.

AMAUROSIS AND AMBLYOPIA.

Under the name of *amaurosis* is understood the troubles of vision which are caused by changes in the tissues of the optic nerve.

Amblyopia is the same affection, but in a lesser degree.

The different causes may have their origin in the retina, optic nerve, cerebrum, or spine.

Functional disturbances, also, not unfrequently lead to this affection.

Hyperæmia Papillæ Optici. — Venous congestion of the papilla has, for a general cause, diseases of the heart. Often, however, it appears after increased intra-ocular tension, such as occurs in glaucoma.

The papilla appears congested, and there is especially an increased size of the veins. When the capillaries are hyperæmic, the patients complain of headache, dizziness, more or less pressure in the eyeball, and oftentimes colored rings and sparkling light are observed over a large part of the visual field.

With the ophthalmoscope, we observe a deep congestion of the optic disk, together with its enlarged vessels, extending over the retina; and not unfrequently ecchymosis is to be noticed on the optic papilla.

Under this condition, impairment of vision may gradually take place, and lead to total atrophy of the nerve.

This disease is often met with in persons who abuse alcohol, tobacco, and opium.

Optic Neuritis. — Inflammation of the optic nerve usually occurs suddenly. Its symptoms are severe headache, intolerance of light, and photopsy. The pupil is more or less dilated, the sight becomes impaired, and may terminate in total amaurosis.

With the ophthalmoscope, we notice that the optic disk appears dim and swollen.

The vessels of the swollen optic disk are hardly to be

observed; the retinal veins are enlarged, while the arteries are contracted. Ecchymosis often occurs.

This disease depends on numerous causes, such as tubercles, cerebral tumors, &c.

When optic neuritis depends on a cerebral affection, its termination is usually in amaurosis.

When it depends on other causes, such as syphilis, a suitable treatment may prevent this termination.

Atrophia Papillæ Optici. — This condition of the optic nerve occurs from disturbances in its nutrition.

If we except the changes which may be produced upon the nerve by diseases of the retina and choroid, we shall find that much more frequently cerebral and spinal affections will give rise to the progressive form of atrophy of the optic disk.

Often, without any symptom of pain, the patient notices the gradual loss of sight.

With the ophthalmoscope, we notice that the pupil is more or less dilated and insensible, and that the optic disk is pearly white, with its circumference well defined, while the vessels are normal.

When this condition depends, as it generally does, on central causes, total amaurosis is its usual termination.

When other causes are known, such as syphilis, its treatment must be directed accordingly.

Embolia of the Retinal Vessels. — The formation of embolia in the central artery of the retina has been observed in consequence of diseases of the heart.

Its symptoms are sudden blindness.

With the ophthalmoscope, we notice that the optic disk and the retina are unaltered ; that their arteries and veins are very contracted ; that their circulation has ceased, except in some veins, which remain tortuous and distended.

When this condition continues, gradually changes take place in the structure of the optic disk and the retina, which have their commencement in the region of the macula lutea.

Amaurosis is the usual result.

Ischæmia Retinæ. — In this disease, the patient becomes suddenly blind, as in embolism of the arteria centralis retinæ. The optic disk and the retina are paler, and the arteries and veins are also contracted.

This disease generally appears in anæmic subjects, and it may also depend upon cerebral tumors.

Permanent amaurosis is consequent upon this affection.

Hemeralopia. — Night-blindness is a kind of disease of the eye, by which the affected person is more or less unable to distinguish objects after sunset. Whenever brought into a dark place, the vision is imperfect.

This condition may depend on torpor retinæ, caused by exhaustion of the nervous structures of the eye, or failure in its general nutrition ; or it may be hereditary.

With the ophthalmoscope, no lesion in the fundus oculi is to be discovered.

Nyctalopia is the reverse of hemeralopia.

The treatment consists in the administration of suitable tonics. The hereditary form is incurable.

When hemeralopia has an intermittent course, sulphate of quinia is indicated.

The use of roast liver, and the vapor of boiled liver on the eye, have been recommended.

Snow and lightning blindness depend on over-excitation of the retina. This affection usually disappears as soon as the cause is removed.

Hemiopia. — Half-vision may depend on extravasation of blood, or tumors in the tract of the optic nerve, partial detachment of the retina, &c.

This disease is usually incurable, as it generally depends on changes in the nerves within the cerebrum. When it has other causes, hemiopia disappears with their removal.

Neuro-Retinitis Albuminosa. — This is a fatty degeneration of the retina, which is observed in Bright's disease, or in diabetes.

Impairment of vision in both eyes is the most prominent symptom. The progress of this symptom is subject to interruptions.

With the ophthalmoscope, we may observe that the retina is more or less covered with numerous yellowish-white patches and spots, immediately outwards from the optic disk, which latter appears swollen and hazy. The arteries are contracted, and the veins swollen. Small red spots of effused blood are scattered in the retina, outwards from the

papilla. These abnormal conditions may gradually disappear, and terminate with atrophy of the affected membrane, whereupon brownish spots are to be seen.

TREATMENT. — The treatment should be directed to the cause of the disease.

Asthenopia. — Asthenopy, or weak-sightedness, is the inability to use the sight for a length of time on minute and near objects, without fatigue of the eyes.

There are two kinds of asthenopy : the *symptomatic* form, such as happens in refraction anomalies, in the different affections of retina, choroid, &c., and which is to be diagnosticated by the ophthalmoscope ; the other kind is the *idiopathic* form, which only exists with complex symptoms, without our being able to discover any marked change in the membranes of the eye.

The subjects attacked with asthenopy, all complain of the same phenomena. Ordinarily, their eyes are soon tired, when at work on near objects. They complain of an uneasy feeling in the temples, which extends to the supra-orbital region ; and are obliged to quit, for several minutes, their occupation. After a short rest, in which the patient firmly closes his eyes, and frequently presses upon them with the thumb and forefinger, he is able to resume his work for a longer or shorter while.

In the beginning, the inconvenience of asthenopy may in this way be partially relieved by the patient ; but, later, the symptoms increase to such a degree, and at so short intervals, he is obliged to give up his occupation.

Frequently, it occurs in delicate constitutions, and in

those who use the eyes in minute and fatiguing works, especially with insufficient or artificial light.

TREATMENT. — When asthenopia depends on an anomaly of refraction, such as in hypermetropia, myopia, and astigmatism, this will disappear when the refraction is corrected with suitable glasses.

When asthenopia occurs in delicate constitutions, such as in those who have chlorosis, bark and iron, separately or combined, should be advised.

In other cases, the treatment will vary, according to circumstances.

Absolute rest of the eyes for a length of time, the use of blue glasses, and repeated cold douches to the eyes, will always act beneficially.

DISEASES OF THE VITREOUS.

Hyalitis. — It is doubtful whether inflammation of the vitreous is an independent disease, since it almost always appears to be complicated with retinitis and choroiditis.

The only real symptom of this disease is cloudiness of the vitreous: other symptoms belong to the diseases by which it is accompanied.

TREATMENT. — Hyalitis must be treated with reference to its complications.

Opacity of the Vitreous. — Opacity of the vitreous varies in degree, so that, when it becomes excessive, it is impos-

sible to observe the fundus oculi distinctly with the ophthalmoscope.

Ordinarily, it seems as if a veil were drawn over the vessels of the retina and the optic disk.

Numerous flocculent bodies are seen floating about in different directions, whenever the patient moves his eyes. Vision is impaired.

The causes of this disease are the results of inflammation of the adjacent structures, syphilis, &c.

TREATMENT. — The treatment should consist in the use of those remedies which promote absorption. Tonics, and iodide of potassium, are the most reliable.

Synchysis. — Fluid vitreous is an alteration of the vitreous, which is characterized by a fluid condition of its contents. Its only marked symptom is diminished tension of the eyeball. Floating bodies are occasionally seen in the vitreous. Vision is more or less impaired.

TREATMENT. — Tonics may possibly be of service in this disease, if any treatment is employed.

Hemorrhage into the Vitreous. — This condition is frequently caused by rupture of vessels of the ciliary processes, and of the retina and choroid, after injury to the eye.

The patient complains of seeing through a red, hazy field.

By examination with the ophthalmoscope, the vitreous appears of a diffuse red color. Often ecchymosis is observed in the retina, while the optic disk is dimly seen. Effused blood in the vitreous is not rapidly absorbed, and

often remains for a long time without any change. When the hemorrhage is considerable, great impairment of vision must be considered as almost certain.

TREATMENT. — Rest is indicated, and cold douches should be applied in recent cases to arrest bleeding.

When the hemorrhage occurs in small quantity, absorption generally takes place, though but slowly.

Musæ Volitantes. — These phenomena depend both on a physiological and a morbid condition.

They consist in the floating about in the field of vision of coherent or isolated globules, or pale cells, which alternately go up and down.

Physiological musæ can be developed by looking steadily at a cloudy sky for a few minutes.

The other kind of musæ volitantes is a new formation of pale cells in the vitreous.

Scotoma. — This disease consists of dark fixed spots, which always keep the same invariable position during the movements of the eye, and which are produced by an abnormal state of the retina.

Scotoma causes impairment of vision.

Cysticercus in the Vitreous. — The cyst of the cysticercus is found to grow out from the retina, or choroid; and, later, it enters the vitreous.

The movements of the cyst have been observed during examination with the ophthalmoscope.

Its removal by operation is mentioned.

Foreign Bodies in the Vitreous.— If foreign bodies, located in the vitreous, are not complicated with internal hemorrhage, they will be easily diagnosticated with the ophthalmoscope.

Immediately after penetration, they produce but little impairment of vision. Should the membranes which they have penetrated cicatrize, the foreign bodies may remain for a length of time undisturbed and encysted in the eye.

Inflammation, however, not uncommonly takes place, with excessive pain in the eye, and may lead to different complications.

The foreign body must be removed, if possible, as soon as it penetrates the eye, and an antiphlogistic treatment adopted.

When the encysted foreign body becomes a cause of sympathetic irritation to the other eye, the diseased eye must be enucleated.

DISEASES OF THE LENS.

Opacity of the Lens.— The disease of the lens, known as cataract, is a partial or total opacity of its own structure, or that of its capsule, whereby the vision is totally or partially disturbed.

According to the seat of the opacity, there are two varieties of cataract, the *capsular* and the *lenticular*.

Capsular cataracts are usually caused by inflammations that have their seat in proximity to the capsule, or they

are produced by trauma. Both varieties lead to the formation of exsudations in the inner and outer surface of the capsule.

At a later period, these exsudations become organized.

These varieties of cataracts also occur in consequence of operations for the removal of the lens.

The extension of the exsudations, and the changes they undergo, have led to the distinction of the different forms of capsular cataract, such as *cataracta trabecularis*, *perlata*, *fenestrata*, *pyramidalis*, &c.

When capsular cataract depends on iritis, it is almost always complicated with synechia posterior to a certain degree.

TREATMENT. — A solution of atropine, two grains to the ounce of water, must be dropped in the eye three times a day, to dilate the pupil. If this result is not obtained, or the dilatation is insufficient in consequence of synechiæ, *iridectomy* is then fully indicated.

In capsular cataracts, secondary to removal of the lens, the opaque tissue must be *later* divided by the needle, and, if found necessary, withdrawn by the canular forceps. Rest in a dark room is necessary.

The local application of the solution of atropine must be continued for a length of time.

Traumatic Cataract. — It frequently happens, in wounds of the cornea, that the capsule and lens are implicated, as is the case with incised wounds, or those produced by foreign bodies, which penetrate through the lens, and lead to opacity of its layers.

If the wound of the capsule is but slight, no serious inflammation may follow, and the wound may cicatrize after a suitable treatment. But, if the capsular wound is serious, and the aqueous humor comes in free contact with the lens, the latter becomes opaque, swollen, and the cause of considerable irritation to the adjacent membranes. Not unfrequently, parts of the wounded lens will be noticed in the anterior chamber.

This condition is of a more serious character, when complicated with prolapsus of the iris through the corneal wound.

Severe inflammation also takes place, when foreign bodies remain in the substance of the lens.

Both of these conditions may lead to destruction of the eye.

TREATMENT. — This depends on the complications that may take place.

In every case of injury to the capsule, where there is no more serious complication than prolapsus of iris, a solution of atropine, two grains to the ounce of water, should be applied to the eye three times a day, in order to dilate the pupil, and reduce the prolapsus, if possible; while a uniform compress bandage must be applied over the eye.

When the retraction of the prolapsed iris is not possible, the slightest amount of irritation will make the snipping off of the prolapsus immediately necessary. The bandage and the atropine must be repeated.

When the lens is wounded, with remarkable prolapsus of the iris, it will be better only to snip off the prolapsus,

and not to interfere with the wounded lens, if practicable, until the margins of the corneal wounds are united. The solution of atropine, and the uniform compress bandage, should be applied as is above mentioned.

When the wounded lens provokes serious inflammation of the eye, no other palliative treatment will be found satisfactory, save its immediate removal by suction, or linear extraction, according to the nature of the wounded lens.

Cataracta Lenticularis. — Lenticular cataracts are distinguished, according to their appearance and development, into *hard*, *soft*, *mixed*, and *zonular* cataracts.

Hard Cataract. — This kind of cataract, which occurs in old age, is characterized by its yellowish color; by its induration, which extends constantly from the centre of the lens towards its periphery; by the compact condensation of its fibres, which do not allow any light to be transmitted into the fundus oculi.

Soft Cataract. — This presents itself, upon examination, as a creamy-whitish bag in the back part of the pupil, which it bulges forwards. Much variety is to be observed in its appearance.

Mixed Cataract. — This opacity of the lens, also called cortical cataract, presents a yellowish-white color, and is developed from the circumference of the lens to its centre, as whitish-gray, triangular-shaped striæ, which are formed in one of the different layers of the lens.

After a length of time, this partial opacity terminates in uniform opacity of the lens.

Zonular Cataract.—This disease of childhood is a congenital affection. After dilating the pupil with atropine, the lens appears whitish-gray, with a more central opacity, radiating from its superficial layers to the circumference, which always remains transparent, and transmits light into the fundus oculi.

This condition not unfrequently remains stationary, but may also become progressive.

Symptoms.—With the exception of traumatic cataract, previously described, the subjective symptoms in the development of the other varieties are quite similar.

With the gradual development of the opacity of the lens, diminution of vision also takes place. Different objects appear surrounded with smoke, or as in a cloud, and are not well distinguished at a distance.

Such persons see better in a cloudy than in a bright day; they are inclined to look towards the ground; while amaurotics, on the other hand, always have their eyes turned towards the sky.

As the opacity advances, the acuteness of vision diminishes, and at last only the shadow of the hand can be seen.

In zonular cataract, the condition of the diseased lens remains for years unchanged.

Patients thus affected, are inclined to hold their heads with the eyes turned oblique, downwards, since they see better in that direction.

TREATMENT. — Sooner or later, according to the variety and the degree of development of the cataract, operative treatment will be required. If both eyes are simultaneously affected, only one should be operated on at a time.

When the cataract is completely soft, it may be operated on either by *suction*, or *linear* extraction.

In senile cataracts, and those cases where the cataract is found to be not completely soft, the ordinary flap operation, or that of the modified linear extraction, must be performed.

When zonular cataract proves to be stationary, iridectomy will improve the sight.

DISLOCATION OF THE LENS.

Dislocation of the lens occurs spontaneously, or from external violence. Displacements from external violence generally take place into the anterior chamber of the eye, and are either partial or total. Ordinarily, this condition is accompanied with hemorrhage into the anterior chamber.

Inflammation frequently follows, and is complicated with lesions of other structures of the eye.

The lens, which is transparent in the beginning, soon becomes opaque. Pain is very severe in this condition, and vision is much impaired.

When the lens is dislocated into the anterior chamber, it will be always advisable to remove it; and the sooner, when complicated with irritation of the eye.

If, however, the lens is dislocated into the vitreous, and complicated or not with rupture of the external coats of the eye, internal hemorrhage always follows; and this affection usually terminates with total destruction of sight.

When, from other causes than those mentioned, the displacement occurs in the posterior chamber, not unfrequently we observe tremulousness of the iris during the movements of the eyes. The dislocated lens, if transparent, and but partially displaced, gives rise to monocular double vision. If totally dislocated, the eye is brought into the same condition that it is in after cataract operation, "*aphakia*."

Acuteness of vision can then be corrected by the use of proper glasses.

DERANGEMENTS IN REFRACTION AND ACCOMMODATION.

Accommodation is the power of the eye to adjust itself, so as to see clearly and distinctly at different distances.

Variations in the amount of adjustment of vision are caused by changes in the curvature of the lens, produced by the action of the ciliary muscles of the eye.

When the eye is at rest, — that is, when there is complete relaxation of its accommodation, — parallel rays of light from infinite distances are united, and brought to a focus on the anterior surface of the retina. Such eyes have a normal refractive power, and are known as "*emmetropic*."

On the contrary, when the rays of light only unite at some distance in front or behind the retina, objects are

seen indistinctly. Such eyes are defective in their refractive power, and are "*ametropic*."

Hypermetropia. — Hypermetropia is an anomaly of refraction, in consequence of which the eyes are able to accommodate only for convergent rays. This is caused by the antero-posterior axis of the eyeball being shortened. Parallel rays for distance, as divergent rays for near objects, with rest of accommodation, only can unite in a point behind the retina.

When the accommodation is completely relaxed, such eyes see both distant and near objects indistinctly.

Hypermetropia is congenital, except in absence of lens, "*aphakia*."

In the majority of cases, hypermetropia is accompanied with symptoms of asthenopia; and, not unfrequently, with convergent strabismus.

Hypermetropia can be diagnosticated with the ophthalmoscope by the erect images of the vessels of the retina, which are seen moving in the same direction with the head of the observer.

Another method of examination is to test the acuteness of vision for distance with types, after having paralyzed the power of accommodation with a solution of atropine. The convex glass, with which the patient sees No. 20 of Snellen's type distinctly at twenty feet distance, is the glass that will neutralize his defect of refraction.

Myopia. — Short-sightedness is a defect in the refractive power of the eye, by reason of which it can only

accommodate itself for divergent rays. In this affection, the antero-posterior axis of the eye is too long. Thus, parallel rays only converge in a point in front of the retina. Hence, such eyes see distant objects very confused; while, in the low degrees of myopia, they see near objects with the same distinctness that normal eyes do.

The phenomenon of which a myopic person complains, is inability to see objects at a distance distinctly. The symptoms of asthenopia frequently accompany myopia in its higher degrees. Divergent strabismus is the usual form of squint in this defect.

Myopic persons have something peculiar in their expression: they are in the habit of half closing their eyelids in distant vision.

With the ophthalmoscope, only the inverted image of the retina can be seen distinctly, while the retinal vessels move in a direction contrary to the motion of the observer.

When the direct method of examining is employed, we must place a concave lens behind the mirror, to obtain a clear image of the fundus.

Posterior staphyloma, however slight it may be, is a quite constant symptom in myopia.

Myopia is almost always a congenital and hereditary disease; but not unfrequently it is acquired by straining the eyes upon minute and near objects, on account of insufficient illumination, &c.

The treatment of myopia is palliative, and consists in the first place in the removal of the predisposing causes, if possible; and, secondly, in correcting the myopia with the lowest suitable glasses, with which No. 20 of Snellen's test-type can be seen distinctly at twenty feet distance.

Presbyopia.—We have seen that hypermetropia and myopia are defects in the refractive power of the eye.

Presbyopia, however, is a diminution by the accommodating power of the eye. Thus, the near point of the sight is removed, while the far point remains unaffected.

This defect is noticeable in old persons.

With proper convex glasses, which enable a person thus affected to read No. 1 of Snellen's test-types at 12 inches from his eyes, presbyopia will be corrected.

The loss of power of accommodation in hypermetropic eyes makes the sight indistinct for any distance.

Such eyes require convex glasses for different distances.

Astigmatism.—Under astigmatism is understood a trouble of vision, which is caused by a difference in the refraction of the rays of light, which traverse the different meridians of the eye.

For distinctness of vision, it is necessary that all the rays which emanate from an object, and traverse the different meridians of the eye, shall unite together on the same point of the retina. If the refraction of rays, which go, for instance, through the vertical meridian, is greater than that of those which traverse the horizontal meridian, the rays of the first will unite on the retina sooner than the rays of the horizontal meridian. This condition causes that form of indistinctness of vision, which is known as astigmatism.

Three kinds of astigmatism are considered by Professor Donders: the *simple*, the *compound*, and the *mixed* form of astigmatism.

In *simple* astigmatism, there is emmetropia in one of the principal meridians, and hypermetropia or myopia in the other one.

In *compound* astigmatism, there is either hypermetropia, or myopia, but in different degrees, in both of the principal meridians.

In *mixed* astigmatism, there is myopia in one of the meridians, while the other is hypermetropic.

Persons thus affected, complain of impairment of vision, combined with symptoms of asthenopia.

Astigmatism occurs very frequently. It is almost always an hereditary disease, but is also caused by defects of the cornea.

When the eye is examined with the ophthalmoscope, either on an erect or inverted image, the optic disk will be seen elongated in one of the principal meridians, and the retinal vessels will appear less distinct in the affected meridians.

Various other methods can be employed for the purpose of ascertaining astigmatism. The easiest mode is to test the eye at different distances with vertical and horizontal black lines of the same size, and equally separated, traced on a white ground. When a person sees the lines traced in one direction distinctly, while those in an another direction are confused, he has astigmatism.

The test tables for astigmatism of Dr. John Green, formerly of Boston, and those of the late Dr. Orestes M. Pray, of Brooklyn, New York, are well adapted for the purpose of ascertaining astigmatism in the various meridians of the eye.

TREATMENT. — This abnormal condition is only to be corrected by suitable cylindrical glasses.

AFFECTIONS OF THE MUSCLES OF THE EYEBALL.

The eyeball may be rotated in every direction by means of its six muscles. Each movement of the eye depends on the combined action of certain muscles.

The muscles of the eye, supplied by their nerves, are the *internal rectus*, the *superior* and *inferior rectus*, and the *oblique inferior*, which are supplied by the *oculomotor* nerve; the *superior oblique* muscle, which is supplied by the *trochlear* nerve; and the *external rectus*, which is supplied by the *abducens* nerve; while branches of the fifth pair, and of the sympathetic, are besides distributed in them. The levator palpebræ is also supplied by the oculomotor nerve.

Paralysis of the Muscles. — The muscles of the eyeball may be attacked by paralysis, either together or separately. Ordinarily, the muscles supplied by the oculomotor nerve are the most frequently attacked; rarely those supplied by the sixth pair, and by the trochlear nerve.

It is of rare occurrence, that paralysis attacks simultaneously the muscles of both eyes.

This condition may be caused by lesions of the brain, where those nerves originate. In other cases, it is the result of syphilis, which causes changes in the periostium,

and other syphilitic growths in the orbit. Effusion of blood in the tissue of the orbit and abscesses, rheumatism, &c., also become a cause of paralysis of the muscles of the eye by the pressure upon their nerves.

Syphilis and rheumatism, however, are known to be the most frequent predisposing causes.

Since every paralyzed muscle loses the power of moving the eyeball in its direction, it becomes a cause of impairment of vision, so that if a person thus affected tries to do so, he sees objects double in consequence of the non-correspondence of the two eyes: he becomes dizzy, and is always obliged to keep the affected eye closed, so as to prevent giddiness.

This inactivity of the affected muscle of the eye, lastly becomes, after a long standing, a cause of strabismus.

Diplopia.—In order that both eyes may see objects single, it is necessary for equal images of the same object to fall upon identical points of the two retinae. When this does not take place, the two eyes do not act correspondingly; and *double* vision is the result.

This can be proved in the following simple manner: If, for instance, we look at an object that we see single, double vision will be provoked, when we exercise a slight pressure with the finger upon any portion of either eyeball.

By this simple method, we may ascertain the existence or not of binocular vision. The best test, however, is by the prism.

Two kinds of double vision must be distinguished, the *homonymous* and the *crossed* form.

The homonymous form of diplopia accompanies *internal strabismus*. The crossed form accompanies *external strabismus*.

To ascertain what form of double vision exists, the patient looks with the squinted eye through a prism covered with a colored glass, at an object at a certain distance, as the flame of a lamp in a dark room. When homonymous forms of diplopia exist, the colored light will be seen at the same side of the eye to which the prism and the colored glass are applied. The reverse is true for crossed double vision.

TREATMENT.—When paralysis of the muscles of the eye depends on syphilis or rheumatism, a treatment suitable for those diseases is indicated.

When caused by tumors in the orbit, they should be removed, and abscesses be opened.

When caused by effusion of blood, its absorption must be encouraged.

When paralysis depends on lesions of the brain, the treatment must be directed accordingly, if practicable.

Faradisation of the affected muscles has been advised.

Diplopia in a slight degree, can be corrected with the use of the prism.

Tenotomy of the antagonistic muscle is also advised.

Strabismus.—Squint or strabismus is the want of co-ordination in the movements of the two eyes. Their optic axes do not converge towards the same object at the same time. Thus double vision results.

There is no actual loss of muscular power, such as is the

case in paralysis; for, when a person thus affected, shuts one eye, the power of the muscles is restored for every distance.

The most frequently occurring form of strabismus is the *convergent* or internal, and the *divergent* or external, squint.

They may be either monolateral, known as “luscitas,” or bilateral, and alternating.

Convergent strabismus occurs the most frequently. In the majority of cases, it depends on hypermetropia. The homonymous double vision accompanies this form of squint; that is, the images of the double vision correspond with the same side of the squinted eye.

Divergent strabismus is not so common as the other variety. It is the ordinary form in myopia. Crossed double vision occurs in this form of squint; that is, the images of the double vision correspond with the opposite sides of the squinted eyes.

TREATMENT. — Division of the affected muscles must be performed. Tenotomy of the muscle of one eye will seldom prove sufficient. Generally, section of the same muscle of both eyes will be found necessary. After the operation, it is advisable for the patient to give the eyes rest for some days. If the eyes feel uneasy, cold compresses can be applied to them.

After operation of strabismus in eyes suffering from hypermetropia, suitable convex glasses must be used to prevent its reoccurrence.

OPERATIVE SURGERY OF THE EYE.

OPERATIVE SURGERY OF THE EYE.

Entropium.—For the operation of inverted eyelids, different methods have been introduced, and as frequently modified.

In cases of slight entropium, almost every method will be attended by a more or less good result ; but in severe cases, those different methods will be found generally unsatisfactory, as they produce only temporary benefit.

The following table of *Fano* will give an idea of the different methods, and their modifications, suggested for entropium :—

By removal of substance of the skin of the eyelid.	{	Transverse excision of skin of the lid,	} Celcius. Janson. Segond. Lisfranc. Brach.
		Vertical " " " "	
		Crucial " " " "	
		Total excision of the skin of the eyelid,	
	{	Excision of a trapezoid flap,	
By mortification of the skin of the eyelid.	{	Compression,	} Bartich, Verduc, Bonafont.
		Cauterization with the actual cautery,	
	{	Cauterization with sulphuric acid,	} Helling.
By tarsotomy.	{	Horizontal incision of the cartilage,	} Ammon's. Guerin. Crampton. Jaeger.
		Vertical " " "	
		Double vertical incision "	
	{	Double vertical and horizontal incision,	

By excision of the cartilages.	{ Complete extirpation, Excision of the free margin, " of a triangular portion, Hollowing out the cartilage,	} Saunders. Gerdy. Schreger. Streatfield.
By promoting adhesions be- tween the skin, the orbicular muscle, and the cartilage of the eyelid.	{ Traversing the thickness of the eyelid with simple or twisted suture, Traversing the eyelid through its thickness by ligature, Subcutaneous ligature, Partial excision of the orbi- cularis muscle, Ligature and enlargement of the palpebral fissure, in the direc- tion of the external commis- sure, By section of the orbicularis,	{ Gaillard, Rau. Williams. Snellen. Anagnostakis. Pagenstecher. Rey.

In the nearly *two hundred and fifty cases of entropium* of different degrees, which I myself have had the occasion to operate upon later, and during my service as oculist in Holland, in the establishment at Veenhuizen for eye-diseases (under the superintendence of Professor Donders and Dr. Snellen), I came to the full conviction, by comparing, during many years, the results of the operations employed for this purpose, that the one of *Streatfield*, modified by *Snellen*, of Utrecht, must be considered as giving the best results.

Method of Snellen. — After the operation for phimosis of the lids is performed, which affection not unfrequently accompanies entropium, the following course is to be pursued: —

Insert the lower blade of Snellen's forceps, or that of Demarre's, beneath the upper eyelid as high as possible, and compress the enclosed eyelid firmly, between the under blade and the upper clamp, by means of the attached

screw ; this precaution will render the operation bloodless.

During the operation, raise the instrument a little, so as not to press on the eyeball.

A transversal incision is the first to be made through the skin of the eyelid, about two lines from the tarsal border, parallel with the margin of the eyelid.

Afterwards, a second incision, parallel to the first, is made at a certain distance above it, and connected with the first incision at its extremities, so as to form an elongated ellipse. The skin enclosed by these two incisions, with its subcellular tissue, should then be dissected out, so as to expose the tarsal cartilage. With a sharp scalpel, or cataract-knife, remove a wedge-shaped portion of the cartilage, in a direction parallel with the margin of the eyelid, taking care not to cut through the conjunctiva. Finally, apply three subcutaneous ligatures in the following manner :—

Take a fine silk thread, provided at each end with a small curved needle ; pass one of the needles through the superior edge of the cartilage, and traverse it farther through its inferior border, so that the point of the needle may penetrate the internal margin of the eyelid ; with the other needle traverse also the inferior border of the cartilage, but a little apart from the first, so that both ends of the threads lie at some distance from each other in the outer free margin of the lid.

When the sutures are all inserted in this manner, they should be firmly tied. This operation will correct the direction of the inverted eyelid, and immediately evert the eyelashes.

After three days, remove the sutures cautiously, and apply collodion to the external surface of the lid, the better to secure the still feeble adhesions.

Ectropium.—Full as many methods have been suggested for the relief of ectropium as for entropium. The following operations will generally answer all purposes:—

1. For severe forms of ectropium, usually caused by cicatrix, make a V-shaped incision, to begin from each commissure, about one line from the free border of the eyelid, enclosing the entire cicatrix. Dissect the V-shaped flap free from all its adhesions; raise then the lid to its normal position, which will give the wound a Y-shaped form, when united in this position by means of twisted sutures.

2. When ectropium is caused by a relaxed condition of the lid, excise a V-shaped portion of the lid, including tarsal cartilage, in the region of the external commissure, and bring the edges of the wound exactly together with twisted sutures.

Tristichiasis.—For the removal of eyelashes, the following mode of operation is indicated:—

Draw the lid upwards, and make a deep incision with the scalpel along the inner margin of the eyelashes, so that the depth of this incision will cause it to meet with a similar one made parallel with the external border, half a line from the eyelashes, into the cartilage. A wedge-shaped portion of cartilage, with the implanted eyelashes, will, in this way, be removed. If any bulbs of the

eyelashes remain after the operation, they should also carefully be removed. No sutures will be required; and only a simple compress bandage, for a few days, needs be applied.

Ptosis.—The operation for this condition consists in the removal of an elliptical portion of the skin of the lid, and its subcellular tissue, and bringing the edges of the wound together with fine silk sutures.

After two or three days, the sutures must be carefully removed, and the surface of the eyelid painted with collodion, so as to prevent breaking of the feeble adhesions of the united wounds.

Phimosis Palpebræ.—The operation can be performed in the following manner:—

The point of one of the blades of the scissors must be introduced into the external commissure of the eyelid, and the enclosed tissue incised in the direction of the external angle of the orbit, so as to enlarge the palpebral fissure.

Subsequently, the conjunctiva, near the external commissure, must be dissected for a few lines, both from the upper and under eyelid, and this be drawn towards the external extremity of the wound, and the edges exactly united with fine silk sutures. The sutures must be removed after the third day, when the wound is generally healed.

Coloboma Palpebræ.—The operation for this defect must be based upon the same principles as that of the hare-lip operation.

The lip on each side must be made free, by dissecting it cautiously, with the scissors, from the adjacent parts it is adherent to. After this is done, the edges of the lips are then excised, and united together exactly with deep and superficial sutures. As in hare-lip operation, the point of junction of both lips of the wounds must be carefully united.

After the third day, the deep sutures must be cautiously removed, and the superficial ones left for a longer time.

Cold-water dressing may be applied.

Anchyloblepharon. — The operation for this condition differs, according to the partial or total union of the margin of the eyelids together.

When this condition is partial, we can easily divide the adherent parts with a pair of scissors having blunt points, or with a scalpel upon a director, introduced behind the lids.

When their condition is a total union of the lids, we must first make a little opening carefully through the lids, by drawing the eyelids from the eyeball, in order that we may introduce the director behind the eyelids.

To prevent a renewed adhesion between the wounded surfaces of the lids during the process of cicatrization, the wound must be daily dressed, and the lids kept separated.

Ablepharon. — Many methods have been employed for the restoration of defective eyelids, such as those of *Diffenbach*, *Fricke*, *Guerin*, and others. In consequence of the

great variety in this defect, a strict method cannot be followed.

The method of *Diffenbach*, however, is the one generally adopted, when the loss is considerable. For the good result of the operation, it will be necessary to take care that the flap to be transplanted is sufficiently large, and has a good pedicle, for its nourishment.

Diffenbach's Method. — In defects of the underlid, for instance, the first thing to be done, is to remove all cicatricial tissue, preserving, if possible, the margin of the lid, and the conjunctiva. For this purpose, a V-shaped wound is made, with its base towards the globe, and including the diseased portions of the lid.

A horizontal incision, extending outwards from the base of the triangle, is next to be made, having a length somewhat greater than that of the base of the triangle. From the outer extremity of this incision, another incision is to be performed in a direction corresponding with the outer side of the triangle, and somewhat longer than the latter. The enclosed flap should next be dissected up, transplanted, and carefully united to the edges of the V-shaped incision, so as not to twist the pedicle.

When this is done, we must unite the conjunctiva, if preserved, to the superior border of the transplanted flap. The remaining wound, caused by the transplanted flap, must be left to heal by granulations.

A water dressing only, need to be applied ; but the part must be cautiously kept at rest.

Symblepharon.—For the successful treatment of this affection after operation, different methods have been suggested, for the purpose of preventing reunion of the lids. The result, however, is generally unsatisfactory.

When the operation is thought practicable, the adhesions may be treated either by *ligature*, or by *division* with the scissors, or with the scalpel, directing then its sharp side towards the eyelid.

The good result of the operation will then depend upon the prevention of the reunion, by passing the end of a probe daily between the surfaces of the wounds.

Operation upon the Lachrymal Passage.—Open, by means of a pair of fine scissors, the canaliculus lachrymalis. Introduce, subsequently, through this opening, a Bowman's probe, or that modified by Dr. Williams, in a horizontal direction, until it enters the opening of the duct. Then, move it gradually upwards in a vertical direction, which will lead it through the nasal canal, into the nostril.

Never use much force, since it not unfrequently leads to false passages in the bony walls of the nasal canal.

Excision of the Lachrymal Gland.—Incise the external commissure towards the temple in such a manner as to evert the lid easily, and expose the outer third of the circumference of the orbit. Divide, then, the cellular tissue, to expose the gland, and isolate the tumor in the depth with precaution, in order to avoid injuring of the adjacent parts. This is done by drawing outwards, gradually, the tumor with the finger, or with a hook, during its removal.

Arrest the bleeding, and unite the external wound with fine silk sutures.

Operation for Pterygium. — Two modes of operation can be pursued for this affection: that of *excision*, and that of *ligation*.

Excision. — The lids are held open by an assistant, or they are adjusted by a spring-speculum. The operator seizes with a forceps the pterygium, near the place of junction of sclerotic with cornea, draws it up from the eyeball, and dissects it cautiously from its apex towards its base. The gaping edges of the wound must then be united with fine silk sutures.

After three days, the sutures must be removed.

Pagenstecher advises to dissect the pterygium only as far as its base, and simply to throw it back, and to unite the two edges of the wound. The pterygium will then shrink away.

Ligation. — After the same precaution is taken as above, to keep the lids apart, the pterygium is drawn up with the forceps. A silk thread then is provided at each end with a fine curved needle, one of which is passed through the base of the pterygium, and the other near its apex. A loop is then formed above. By dividing this, and the needles from the threads, four separate threads will be left passing through the pterygium. Both of the ends of the same thread must be tied together. The inner and outer threads are first tied, and subsequently the two middle ones.

After three to four days, the ligated pterygium is raised with the forceps, and removed.

After either of the operations, a cold compress may be applied.

Paracentesis of the Cornea. — After an assistant has raised the upper lid, and the operator has drawn the underlid downwards from the eyeball, the latter passes the point of a broad needle through the cornea towards its lower margin into the anterior chamber, taking care not to wound the iris, or the lens, with the needle. He then turns the needle on its edge, to allow the escape of aqueous humor, and then withdraws the needle from the eye in the same position as it was introduced.

A slight compress bandage must be applied over the closed lids after the operation.

Operation of Corelysis. — This operation is performed in cases of synechia, where the pupil is only partially closed.

The patient should lie on a couch, and the pupil should be dilated with atropine, in order to discover the parts which adhere. A spring-speculum should then be introduced between the lids, to keep them separated. The operator, standing behind the patient, must fix the eyeball, by seizing a conjunctival fold near the margin of the cornea, with the forceps. An opening is then made in the cornea with a lance-shaped knife, opposite to the place of the adhesions, and large enough to pass the hooked spatula of Streatfield through the wound into the anterior chamber, and to direct it between the points of adhesions; and then, by slight lateral movements, to tear them through.

After this is done, atropine should be dropped into the eye two or three times a day, and a compress bandage applied.

Operation of Iridectomy. — This operation can be performed on a patient sitting up, or in a recumbent position.

After the eyelids are kept apart by a spring-speculum, the operator stands behind the patient, fixes the eyeball, by seizing a fold of the conjunctiva near the cornea, with a forceps, opposite the point at which the iridectomy is to be performed. He then makes, with a lance-shaped knife, an incision in the cornea, about one line from its margin, into the anterior chamber, in front of the iris; and the knife is then removed cautiously.

When this is done, he introduces an iridectomy forceps through the wound, and seizes the iris carefully near its pupillary border, withdraws a fold of it through the wound and has it cut with a pair of delicate curved scissors by an assistant.

During the operation, great care should be taken not to wound the lens.

If the iris prolapse of itself, after the corneal wound has been made, the operator raises it by the iridectomy forceps; and the iris is snipped off by the assistant, close to the pupillary margin of the cornea.

The instruments used to separate and to fix the eyeball should then be withdrawn, and the eyes closed with a mild compress bandage.

Iridodesis. — The patient should be placed in a recumbent position ; the operator stands or sits behind him, and separates the lids with a spring-speculum.

A fold of the conjunctiva must next be taken up, near the margin of the cornea, with the forceps opposite to the place of puncture. A narrow lance-shaped knife is then introduced into the sclerotic, close to the margin of the cornea, so that it may penetrate into the anterior chamber, in front of the iris. The lance being removed, a pair of iridectomy forceps must be passed through the wound, and a portion of the iris grasped, and withdrawn from the external wound. In place of snipping off the extruded fold of iris, it should be tied close to the margin of the wound, with a piece of fine silk thread. The wound will unite, and entangle the iris in its cicatrix.

Reclination of Cataract. — This operation, which is almost abandoned for its accidental bad results, is performed as follows : —

After the pupil is dilated with atropine, the patient is seated on a low chair, and the operator on a higher one opposite, while the sound eye of the patient is covered.

An assistant, placed behind the patient, fixes the head immovably against his breast with one hand, and with the other holds up the upper lid. The operator then depresses the under lid with one hand, and with the other passes the point of a needle through the sclerotic, about a line from the circumference of the cornea.

The needle is then to be directed between the iris and the

superior border of the lens, breaking down the suspensory ligament; and the lens is to be depressed back, and downwards. The needle should then be removed in the same position as it was introduced, and the eyes closed with a bandage.

Operation for Absorption of Cataract.—The pupil being previously thoroughly dilated with atropine, the patient should lie on a couch, in front of a good light. The eyelids should be kept apart by a spring-speculum. The operator, sitting or standing behind the patient, passes a needle through the cornea, within one and a half lines of its outer margin, and tears the anterior surface of the capsule open, and next punctures the lens, to allow the aqueous humor to come in contact with the substance of the lens. Care should be taken not to wound the iris, or exercise any pressure on the lens. After the operation is performed, the needle should be cautiously withdrawn, a bandage applied, and atropine introduced into the eye three times a day.

The operation will generally need to be repeated after an interval of four weeks.

Flap Extraction.—The performance of this operation is divided into three stages.

1st, The patient reclines on a couch, with his head a little raised, and a spring-speculum is applied under the lids to keep them separated. The operator places himself behind the patient, seizes upon a fold of the conjunctiva, in order to steady the eyeball. With the other hand, in

which he holds a cataract-knife after the manner of a writing-pen, he passes the point of the knife through the cornea, about half a line from its margin, into the anterior chamber, in such a direction that the point of the knife pierces the opposite part of the cornea, about the same distance from its margin as at its entrance. The blade is kept parallel with the iris, and pushed onwards, until the section of the corneal flap is completed, implicating a small part of the conjunctiva.

The spring-speculum must then be removed, and the eyes kept slightly closed.

2d, After a few minutes' rest, the operator opens the lids, and orders the patient to look in the opposite direction of the point where the flap is made; he then introduces the cystotome, with its convexity downwards, into the anterior chamber, to prevent injury of the iris. When opposite the pupil, the instrument should be rotated, and with its point lacerate the capsule in different directions, and be withdrawn in the same position as it was introduced: the eye should then be kept closed for a few minutes.

3d, The operator separates the lids with one hand, and with the other a gentle pressure is to be made on the eyeball, with the convex surface of the curette, opposite the part in which the flap is made; and the lens is gradually removed from its position through the corneal incision.

After the lens is removed, the eyes should be closed cautiously for some minutes, and then be examined, to see whether lenticular fragments are retained in the anterior chamber, which should be removed. Having ascertained that the lips of the wound are in their normal position, the eyes must be closed with a compress bandage.

Dr. Williams, of Boston, advocates the adjustment of the edges of the flap with fine silk sutures.

Jacobson has advised the performance of iridectomy simultaneously with the removal of the lens.

Later, iridectomy is made prior to the removal of the lens.

Sperino and *Pagenstecher* advocate the removal of the lens in its capsule, and combine the operation with iridectomy.

*Wolfe's Improved Method.** — In either case, the operator performs iridectomy exactly in the vertical meridian of the eye, so that the coloboma iridis shall correspond with the centre of the subsequent corneal section. The extraction is done as follows: —

The patient being in a recumbent position upon a high couch, and the eyelids being held aside by an assistant, he stands behind the patient, operating with the right hand on the right eye, and with the left hand on the left eye.

With the right hand he fixes the globe by means of the pique de Pamand, which he considers the most suitable instrument; with the narrow Beer's knife in his right, he enters the external margin of the cornea close to its sclerotic junction, perpendicular to the surface, as if wishing to reach the iris, in order to prevent the knife running between the layers of the cornea, and also in a downward direction, after Graefe's example, in order to enlarge the internal opening. After the point is seen in

* London Lancet, September, 1868, page 533.

the anterior chamber, he carries the handle backwards, and passes to the counter-puncture, which is made directly opposite on the inner-side. The points of puncture and counter-puncture are so made that the corneal flap extends to a line more than one-third of its circumference. The knife is then pushed on in a plane parallel to the iris, until the corneal section is nearly completed, when its edge is inclined a little backwards, so as to carry it under the conjunctiva, and it is then withdrawn, leaving a conjunctival bridge in the centre.

At this stage, the operator takes entire charge of the eye. His two fingers of the left hand serving the purpose of a speculum, he orders the patient to look down, and introduces one blade of the probe-pointed scissors in the track of the knife, and, carrying it to the conjunctival flap, divides it. The capsule is then largely opened with the cystotome. To facilitate this process, gentle pressure with the fingers upon the eyeball is necessary to make the capsule tense.

After a few seconds of rest, the operator seizes a fold of the upper eyelid between his fingers, and the lower he depresses with the other thumb, and, directing the patient to look down, he exercises pressure on the lower part, exactly in the vertical meridian, facing the middle of the coloboma iridis; and, with the other fingers through the eyelid, he presses upon the wound to make it gape, when the cataract advances through the corneal and conjunctival flap.

Dressing consists in two strips of court plaster, wadding, and Liebrich's bandage.

Suction Operation.— This operation is only to be performed on soft cataract. The operation is as follows:—

After the pupil is dilated, the patient being in a recumbent position, the operator makes an opening towards the margin of the cornea, with a broad cataract needle, into the anterior chamber, and opens the capsule of the lens. The fine flageolet-shaped mouth-piece of Bowman's cataract syringe is then introduced, through the wound, into the soft lenticular matter, and the lens sucked into the syringe, and then removed from the eye.

The pupil must be kept dilated for a time, and a compress bandage applied on the lids.

Linear Extraction.— The operation can be executed either with or without iridectomy. The following manner is the one usually followed:—

The patient's pupil being dilated with atropine, he reclines on a couch. The operator, behind him, adjusts the eyelids with the spring-speculum, and keeps the eye fixed by seizing a fold of the conjunctiva with the forceps. Subsequently, he passes the point of a lance-shaped knife, about two lines from the circumference of the cornea, directly between the cornea and iris. After an incision is made, sufficient for the removal of the lens, the knife is removed, and iridectomy performed. The spring-speculum and the forceps should then be removed, and the patient directed to close his eyes cautiously for a few seconds.

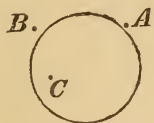
After some rest, the operator raises the upper lid with his fingers, while with the thumb he depresses the under lid, and the capsule of the lens is lacerated in the manner

previously described. The lens is then to be removed with the scoop, which must be introduced through the wound of the cornea, and directed between the posterior surface of the lens and its capsule, and subsequently withdrawn from the eye, together with the lens.

If any portion of the lens remains in the anterior chamber, this is to be scooped out cautiously, and then the eyes closed with a bandage.

*Von Graefe's Modified Extraction.** — “The patient being placed on the couch, the lids separated by an adjustable speculum, — I prefer the one recommended by Critchett, — and the eyeball drawn downwards by spring-forceps, which are applied immediately below the cornea, the operation is commenced.

“Step I. *The Incision.* — The point of a small knife, the cutting edge being directed upwards, and the surface forwards, is inserted at the point A (see fig.), so as to enter the anterior chamber as peripherally as possible. In order to widen the extent of the inner wound, the point should, at first, not be directed towards B, — *i.e.*, the point of counter-puncture, — but rather towards C; only when the knife has advanced fully three lines and a half within the visible portion of the anterior chamber, should the handle be lowered, and the instrument directed along the scleral border on to B. As soon as the resistance to the point is felt to be overcome, showing the counter-



* Ophthalmic Review, vol. iii. p. 72.

puncture to be accomplished, whether the upper-lifted conjunctiva be transfixed or not, the knife must immediately be turned steeply forwards, the back of it being almost directed to the centre of the ideal sphere of the cornea, when the incision is to be continued in this plane, first by boldly pushing the knife onwards, and then, after its length is exhausted, drawing it backwards. Should this latter movement, though generally sufficient, fail completely to divide the scleral border, the sawing manœuvre must, to a less extent, be repeated. As soon as the last bridge of the scleral border is cut through, the knife lies freely movable under the uplifted conjunctiva, which, in order to avoid the formation of too long a flap — the proper height is $1\frac{1}{2}'''-2'''$ — must now be divided by a sawing movement horizontally forwards, or even forwards and downwards.

“Step II. *The Iridectomy.*—The holding forceps having been handed to an assistant, with a straight pair of iridectomy forceps, — I use a very small pattern, — we lift the conjunctival flap off the prolapsed iris; the former, merging as it does into the limbus, and there being, from the previous extensive loosening, no further resistant sideways, is easily reflected down over the cornea, when the iris appears perfectly bare. Hereupon, the prolapse of the iris is seized with the same forceps, as its central and most vaulted portion: it is gently pulled upon, so as to make it present a triangular shape, and excised at its base from one corner of the wound to the other, to which end usually two slight strokes of the scissors are required.

“Step III. *Dilaceration of the Capsule.*—The operator, having resumed the fixing forceps, now, with a

cystotome properly bent, and which is armed with a fleam, opens the capsule by two successive rents, beginning from the lower edge of the pupil, and ascending successively along its nasal and temporal margins, near the upper equator of the lens.

“Step IV. *Evacuation of the Lens.*—The mode of evacuating the lens varies, according to the amount of soft surface matter. Where there is plenty of it, the delivery is, as a rule, effected without the introduction of any instrument, merely by external pressure. The back of a broad and moderately arched spoon is, close to the centre of the incision, gently pressed against the sclera, so that the wound is made to gape. Thus, cortical masses are caused to escape; and the vertex of the nucleus presents itself. In order to promote, as much as possible, the thorough exit of the latter, the back of the spoon is made to glide along the sclera, first with an equable degree of pressure, laterally towards the corners of the wound, and, thereupon, withdrawing it from the wound upwards, with a continuous increase of pressure. If, during these movements, the diameter of the nucleus presents itself, the pressure is more and more abated, and the delivery may be completed by applying the end of the spoon to the projecting edge of the nucleus. If there be but a thin stratum of soft cortex, the recommended ‘slide manœuvre’ may likewise be tried, but ought to be abandoned as soon as we observe that during the lateral movements no presentation ensues; in this event, the hook must be resorted to, which, in the case of hard cataract, is required *ab initio*. The blunt hook which I am in the habit of

employing, has its stem bent in such a manner as to enable it to be readily pushed under the nucleus. It is first laid flat on the opening made in the capsule, thereupon drawn back over the near edge of the nucleus, when, by a suitable elevation of the handle, it is brought in the direction of the posterior cortex, along which it is then pushed forward on the flat, until it has passed the posterior pole of the nucleus. The instrument is now, between the fingers, rotated around its axis, so that the plane of the curved extremity of the hook exchanges its horizontal for the vertical position; or, should resistance be felt, an oblique one, and the nucleus, or, as the case may be, the whole lens is, by a gentle traction, carried towards the incision.

“Step V. *Clearing of the Pupil, and Coaptation of the Wound.* — If, as happens in the majority of cases, after extraction of the nucleus, cortical masses remain, they must be evacuated by gentle pressure and friction, exercised with the finger-ends through the medium of the lids, and in accordance with the well-known rules for the same purpose observed in flap-extraction. Only in exceptional cases may a small spoon be introduced for the removal of isolated cortical fragments, which may be particularly adherent to the capsule. Very delicate coatings of the capsule, if their evacuation be difficult, are better left behind; but, on the whole, as complete a removal as possible of the cortex should be insisted on. Finally, the wound is to be cleared with forceps from any adherent iris-pigment, or coagula, and the conjunctival flap replaced in its proper position.

“Regarding the after-treatment I may be brief. The usual compressive bandage must be applied, and first renewed five or six hours after the operation, afterwards twice (or even once) a day. In regard to light, the habitual cautions must be observed. Rest is to be recommended, but less rigorously than after flap-extraction. If necessary, the patient may pass even the first days following the operation out of bed. Respecting the diet, every thing may be allowed, excepting stimulants, and such aliments as require mastication. From the second day I apply atropine (usually twice a day), chiefly to prevent coalescence of the two corners of the sphincter with the capsule. Only where copious conjunctival secretion either existed before, or became apparent after the operation, I defer the application. If any thing untoward occurs, a cautious yet accurate examination (always by artificial light) must decide whether it originate from the wound, the cornea, the iris, or the capsular cells, when the proper measures have to be taken in accordance with the customary rules. On the whole, departures from the normal course are but rarely observed.”

“Making a summary of all the operations in these one hundred cases, it ensues that there were eighty-nine operations executed without any accident whatever from the beginning to the end; and of the eleven operations, accompanied with untoward accidents, four only can be laid to the charge of the operator.

“This is, I think, not an unfair percentage, but impresses, nevertheless, the writer of these lines very strongly with the conviction that further unremitting study, care, and

practice are needed to perform every step of this admirable operation with the greatest possible neatness and safety." *

Accidents. — In the operation for cataract we are exposed to different accidents.

The Flap may be too Small. — This error cannot easily occur with care and practice. When, however, this is the case, the wound must be carefully enlarged with a pair of delicate scissors.

The Flap may be too Large. — When this happens, and the operator cannot prevent, on this account, wounding of the scleral vessels, hemorrhage into the anterior chamber will occur. After the removal of the cataract, the position of the flap should be secured by one or two fine silk sutures.

Hemorrhage into the Anterior Chamber. — This troublesome accident may occur after injury to the scleral or conjunctival vessels, or the iris, during the operation. The operation should then be postponed for a few seconds, in order that the blood may coagulate, or the aqueous humor be restored. It will then generally be sufficient, for the evacuation of the blood, to make a gentle friction over the cornea.

* Prof. Knapp, *Archive of Ophthalmology and Otology*, 1869, New York, vol. i. No. I. p. 115.

Wound of the Iris. — When the total escape of aqueous humor occurs during the puncture of the cornea, and the iris bulges forwards, and would be extensively wounded by proceeding farther, it will be advisable to withdraw the knife, and postpone the operation. If, however, only a small portion of the iris is in front of the knife, it should be excised during the completion of the section of the cornea.

Escape of the Vitreous Humor. — This accident may occur *before, during, and after* the removal of cataract. When an escape of the vitreous humor occurs *before* the removal of the cataract, the operation must be suspended for a few minutes, the eye carefully closed, and the head of the patient kept supine. After some rest, we may then succeed in withdrawing the cataract with Von Graefe's hook, or with the scoop. When, however, the vitreous escapes *during* or *after* the removal of the cataract, it will be better, on account of the danger of its further loss, to apply immediately a compressing bandage on the eye, and keep the head in a low position.

Difficulty in the Removal of the Cataract. — This condition is chiefly caused by synechia, or by an unusually large cataract. In those cases, iridectomy must be performed to facilitate its removal.

Prolapse of the Iris. — When this accident occurs immediately after the removal of the lens, and the iris is not wounded, its replacement must be tried. When the iris, however, has suffered during the operation, or the re-occurrence of the prolapsus is feared, this must be snipped off with the scissors.

Operation for Strabismus. — Suppose the internal recti muscle is to be divided, it may be done in the following manner: —

The patient reclining on a couch, the spring-speculum is introduced between the lids, and they are moderately separated. An assistant takes up a fold of the conjunctiva with the forceps, and everts the eyeball. The operator then seizes another fold of the conjunctiva, near the margin of the cornea, in the direction of the muscle to be divided. He then divides this fold of the conjunctiva with the scissors, and makes the conjunctiva free from its sub-cellular tissue. Subsequently, he passes a blunt-pointed hook through the sub-conjunctival opening, against the sclerotic, and near the tendon of the muscle, and includes the latter in the hook. The tendon then, being exposed, is to be cut through with the scissors. A smaller blunt-pointed hook is afterwards passed through the wound, to ascertain that not any fibres of the tendon have remained undivided. This being done, the instruments are to be removed.

Enucleation of the Eyeball. — The patient should lie on a couch, and ether or chloroform be administered. The lids being adjusted with the spring-speculum, a fold of the conjunctiva is seized with the forceps, near the circumference of the cornea, and the conjunctiva and the tenon-capsule be completely divided around the cornea with a pair of fine curved scissors. Next, every muscle must be divided close to their insertion into the sclerotic, and the globe drawn slightly forwards. The curved scissors are

then passed behind the eyeball, the optic nerve divided, and the eye removed from its cavity. The spring-speculum having been removed, and any hemorrhage arrested, a cold water dressing is to be applied over the lids.

Artificial Eye.— This is used after the eyeball is excised, or destroyed by other causes. The mode of introducing and removing it is as follows :—

The upper lid must be raised, while the patient looks downwards, and the upper border of the artificial eye pushed under the lid, while, with a little manipulation of the under lid, the eye slips into the lower palpebral fold.

When the artificial eye is to be removed, the lower lid must be depressed, and the point of a blunt instrument introduced beneath the lower edge of the artificial eye, and pressed forward, whereupon the eye glides out, and falls in the hand, or on a soft cushion ready to receive it.

The artificial eye should be removed on going to bed, and immediately cleaned with water.

An artificial eye must never be worn until all symptoms of irritation are arrested.

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